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:

Project Title: Waste Heat Recovery for Power Generation Project in SGIS Songshan Co., Ltd.
Ver. 3.2
Date: 01/08/2011

A.2. Description of the project activity:

Summary:

Waste Heat Recovery for Power Generation Project in SGIS Songshan Co., Ltd. (hereafter referred as "the proposed project" or "the project") is located in the Sintering Plant of SGIS Songshan Co., Ltd. (hereafter referred as "SGIS"). The project is constructed and operated by SGIS, and involves the construction of a captive power plant, which employs the waste heat from two 360m^2 sinter machines to generate electricity by a simple condensing steam turbine and generator unit. The installed capacity is 25MW [1] with annual power generation of 140,417MWh, corresponding to the plant load factor of 64.1% [2], and the annual power supplied to the internal electricity system of SGIS is 126,768MWh [3].

The scenario existing prior to the start of the implementation of the project activity

- The waste heat produced in the process of sintering was released into the atmosphere without utilization;
- SGIS receives about 66% of its electricity demand from captive plants. The remaining 34% [4] is from South China Power Grid.

The baseline scenario

The waste heat produced in the process of sintering would be released into the atmosphere without utilization, and the electricity supplied by the project activity would have been supplied by South China Power Grid.

The project scenario

- The waste heat produced in the process of sintering will be recovered for power generation. The project activity consists of a waste heat recovery system, a steam turbine and generator system, auxiliary equipments, and a power supply and distribution system. The proposed project will install

[1] In China, due to the historical reasons and technical limitation, the rated steam intake volume of turbine are already fixed, based on "Technical Manual of Thermal Power Equipment" issued by the Chinese Power Engineering Society, page 1-4, the standard series model of turbines are 6MW, 12MW, 25MW, 50MW and so on. According to the approved FSR, in the condition that all the waste heat utilized to generate electricity, the actual rated power capacity is 23.9MW. But as the standard model of turbine nearest to the designed capacity of 23.9MW is 25MW, the project owner had to choose the turbine with 25MW capacity, otherwise, it would cost much more if the project owner customized turbine with 23.9MW.Therefore, standard turbine with capacity of 25MW was chose for the project activity. Thus, 23.9MW instead of 25MW should be empoyed to calculate the power generation.
[2] The plant load factor of this project is calculated as: 140,417MWh/25MW/8,760hours=64.1%.
[3] The annual power generation is 140,417MWh and auxiliary electricity consumption rate is 9.72%, both of which come from the approved Feasibility Study Report (FSR), thus the electricity supplied to the system is calculated as: 140,417×(1-9.72%)=126,768MWh
[4] The percentage is calculated based on the 2009 Shaogang Power Generation Report.

two waste heat boilers with each unit output of medium-pressure 47t/h and low-pressure 20t/h, one unit of steam turbine and one unit of QF_2W-25-2 generator will be installed for electricity generation.

- The electricity generated by the project will replace equivalent electricity supplied from South China Power Grid. Electricity supplied by the existing captive cogeneration plants will remain the same and the existing captive plants will not be affected by the project activity (see detailed description in section B.4).

Therefore, the project will utilize waste heat produced in the process of sintering for power generation, replacing equivalent amount of electricity supplied from South China Power Grid, which is dominated by fossil fuel fired power plants. Hence relevant GHG emissions from South China Power Grid will be reduced, and the estimated annual emission reductions are 99,880tCO_2e.

Contribution to sustainable development:

The proposed project complies with the national industrial policy and promotes sustainable development of the energy industry. In particular, the project activity contributes significantly to the region's sustainable development in the following ways:

- Improving energy efficiency of the iron and steel industry in Guangdong province in general and improving energy efficiency at SGIS in particular;
- Reducing the reliance on fossil fuels;
- Reducing the emission of local pollutants caused by the use of fossil fuels and associated adverse health impacts;
- Reducing the greenhouse gas emissions caused by the use of fossil fuels and mitigate global climate change;
- Increasing employment opportunities, increasing incomes and improving the overall quality of living.

A.3. Project participants:

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)	SGIS Songshan Co., Ltd. (as the project owner)	No
Denmark	Danish Energy Agency (as the CERs buyer)	Yes

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Guangdong Province

A.4.1.3. City/Town/Community etc:

Maba Town, Qujiang County, Shaoguan City

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

The project is located in Sintering Plant of SGIS, which is located in Maba Town, Qujiang County, Shaoguan City, Guangdong Province, China. The exact location of the project is at the east longitude of 113°38'08" and north latitude of 24°42'18".
A map in Figure A.1 indicates the location of the project site.

Figure A.1 the Location of the Project Activity

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

The project activity uses waste heat from sintering facilities of SGIS to generate electricity, which falls under the category described under CDM as:
Sectoral Scope 1: Energy Industries, and
Sectoral Scope 4: Manufacturing Industries

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

The scenario existing prior to the start of the implementation of the project activity:

- The sintering plant of SGIS has two 360m^2 sintering machines, producing waste heat about 600GJ/h, which was released into the atmosphere without utilization.

- The electricity generated by the project will replace equivalent electricity supplied from South China Power Grid, and the electricity supplied by the existing captive plants will remain the same (see detailed description in section B.4).

The baseline scenario:

- The waste heat, which will be utilized by the project, would otherwise have been released directly into the atmosphere in absence of the project; and
- Equivalent amount of electricity generated by the project would otherwise have been supplied from South China Power Grid.

The project scenario:
The proposed project mainly includes a waste heat recovery system, a steam turbine and generator system, auxiliary equipments, and a power supply and distribution system.

The waste heat from two sinter machines will pass through the waste heat boilers from top to bottom. And all the steam generated in the waste heat recovery boilers will be fed into the 25MW steam turbine to generate power.

The installed capacity of the project will be 25MW, annual power generation is 140,417MWh, and annual power supply is 126,768MWh. The project will employ two waste heat boilers, one unit of steam turbine and one unit of QF_2W-25-2 generator for power generation. The key technical parameters are shown in Table A.1:

Table A.1 Key technical parameters to be utilized for the project

Main Technical Data		Value	Data source
Waste heat boiler	Unit	2	FSR
	The rated output	medium-pressure 47t/h	
		low-pressure 20t/h	
	Waste gas flow rate	770,000 Nm^3/h	
	Inlet waste gas temperature	400℃/285℃	
	Outlet waste gas temperature	150℃	
	Rated steam temperature	375℃/225℃	
	Rated steam pressure	medium-pressure 1.96MPa	
		low-pressure 0.49MPa	
Steam turbine	Unit	1	

	Model	Condensing steam turbine	
	Rated capacity	25MW	
	Pressure of main entering steam	1.96MPa	
	Temperature of main entering steam	370℃	
	Rated rotate rate	3,000r/min	
Generator	Unit	1	
	Type	QF_2W-25-2	
	Rated capacity	25MW	
	Rated voltage	10.5kV	
	Rated rotate speed	3,000r/min	

Note: the lifetime of the equipments is not shown in manufacturer's specifications and industry standards, so the estimated lifetime of the project employs 15 years referring to the FSR.

The electricity generated by the project will be connected to the 10kV system directly after satisfy the internal auxiliary electricity consumption of the project, and then the electricity will be connected to the internal electricity system of SGIS, replacing the equivalent amount of electricity supplied from South China Power Grid. The project will employ meters to monitor the electricity supplied by the project. (See details in Section B.7.2)

There is no direct technology transfer related to the project activity since all the technology employed is from domestic manufacturers.

The project will have limited impacts on the local environment as most of the impacts are temporary. The project will employ appropriate measures to minimize the impacts. On the contrary, by utilizing waste heat for power generation, the project will bring positive impacts on local environment. More detailed information regarding the impact on the environment is provided in Section D.1 of this PDD.

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

The project activity applies a fixed crediting period of 10 years. And the estimation of the emission reductions during the crediting period (from September 1, 2011 to August 31, 2021) is presented in Table A.2. Estimated emission reductions during the crediting period are 998,800tCO_2e.

Table A.2 Estimation of the Emission Reductions in the Crediting Period

Years	Annual estimation of emission reductions in tones of CO_2e
Year1: 01/09/2011-31/08/2012	99,880
Year2: 01/09/2012-31/08/2013	99,880
Year3: 01/09/2013-31/08/2014	99,880
Year4: 01/09/2014-31/08/2015	99,880
Year5: 01/092015-31/08/2016	99,880
Year6: 01/09/2016-31/08/2017	99,880
Year7: 01/092017-31/08/2018	99,880
Year8: 01/092018-31/08/2019	99,880
Year9: 01/09/2019-31/08/2020	99,880
Year10: 01/09/2020-31/08/2021	99,880
Total estimated reductions (tonnes of CO_2 e)	**998,800**

Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	99,880

A.4.5. Public funding of the project activity:

There is no public funding from Annex I parties available for the 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:

Baseline and monitoring methodology:

Approved consolidated baseline and monitoring methodology ACM0012 (version 3.2) *"Consolidated baseline methodology for GHG emission reductions for waste energy based energy system"*.

The *"Tool to calculate the emission factor for an electricity system" version 2.2.0* is used to calculate the emission factor.

This methodology and the tool can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Additionality Tool

The *"Tool for the Demonstration and Assessment of Additionality", Version 5.2,* (the EB 39 meeting) is used to demonstrate the additionality of the project activity.The tool can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

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

Applicability

All the waste heat in identified WECM stream/s that will be utilized in the project activity would be released to atmosphere in the absence of the project activity at the existing facility. The waste heat is an energy source for generation of electricity. Therefore, according to ACM0012, the project is Type-1 project.

The project activity meets the applicability criteria of the selected methodology ACM0012, as tabulated below:

Methodology applicability criteria	Project activity in accordance with the applicability criteria
If the project activity is based on the use of waste pressure to generate electricity, electricity generated using waste pressure should be measurable.	N.A. The project involves the utilization of waste heat.
Energy generated in the project activity may be used within the industrial facility or exported from the industrial facility;	The electricity generated by the project will be supplied to the internal electricity system of SGIS, replacing import of electricity from South China Power Grid.
The electricity generated in the project activity may be exported to the grid or used for captive purposes;	The electricity generated by the project will be connected to the internal electricity system of SGIS and used for captive purpose.
Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility.	The energy in the project is generated by SGIS which is the owner of the industrial facility (two 360m^2 sinter machines) producing the waste heat.
Regulations do not constrain the industrial facility that generates waste energy from using the fossil fuels prior to the implementation of the project activity.	There is no regulation constraining the industrial facility that generates waste heat from using the fossil fuels prior to the implementation of the project activity.

The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	The project utilizes the waste heat produced by existing facilities (two 360m^2 sinter machines) for power generation, and no capacity expansion is planned
The emission reductions are claimed by the generator of energy using waste energy.	The emission reductions of the project are claimed by the generator of energy using waste heat.
In cases where the energy is exported to other facilities, an official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source.	The emission reductions generated will only belong to SGIS, who operates both the project energy generation plant and recipient plants.
For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: ※The remaining lifetime of equipments currently being used; and ※ Credit period	Prior to implementation of the project activity (current situation), in the project boundary, there is no any power generation facility. Hence, the fixed crediting period of 10 years meets the criteria.
Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for.	Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant will not be accounted for.
This methodology is not applicable to projects where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, the projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology.	N.A. The project is not implemented in a single-cycle power plant.

Therefore it can be concluded that the project meets all application conditions of methodology ACM0012. Therefore, methodology ACM0012 is applicable to the project.

Demonstration of use of waste energy in absence of CDM project activity

For Type-1 project activities: it shall be demonstrated that the waste energy utilized in the project activity was flared or released into the atmosphere (or wasted in case of project activity recovering waste pressure) in the absence of the project activity at the existing facility by either one of the following ways.

- By direct measurements of the energy content and amount of the waste energy produced for at least three years prior to the start of the project activity;
- Providing an Energy balance of the relevant sections of the plant to prove that the waste energy was not a resource of energy before the implementation of the project activity. For the energy balance applicable process parameters are required. The energy balance must demonstrate that the waste energy was not used and also provide conservative estimations of the energy content and amount of waste energy released;
- Energy bills (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste energy and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities;

- Process plant manufacturer's original design specifications and layout diagrams from the facility could be used as an estimate of the quantity and energy content of the waste energy produced for the rated plant capacity/per unit of product produced;
- On site checks conducted by the DOE prior to project implementation can confirm that recovered under the project activity, had been installed prior to the implementation of the CDM project activity.

The project activity will be completed in May 2011, and currently the waste heat produced in the process of sintering is being released to the atmosphere without utilization, which can be demonstrated by DOE during on site check.

Currently, there are two captive cogeneration plants, two TRT power plants and two CDQ power plants implement in SGIS, which can only supply 66% of the power demand of SGIS, SGIS have to purchase power from South China Power Grid, therefore, the project is impossible to replace the output of the existing captive cogeneration plants, existing TRT power plants and existing CDQ power plants. It can be confirmed by the DOE on-site verification.

Since this project will replace the equivalent electricity of South China Power Grid, as per ACM0012, "*Tool to calculate the emission factor for an electricity system" version 2.2.0* is used to calculate the baseline emission factor.

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

As per ACM0012, The geographical extent project boundary shall include the following:

1. **The industrial facility where waste energy is generated, including the part of the industrial facility where the waste gas was utilized for generation of captive electricity prior to implementation of the project activity;**

   For the project, the industrial facility where waste heat generated is the two 360m^2 sintering facilities in the Sintering Plant of SGIS.

2. **The facility where process heat in element process/steam/electricity/mechanical energy is generated (generator of process heat/stream/electricity/mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary; and**

   For the project, the facility where electricity is generated includes two waste heat boilers, the turbine and the generator and all other auxiliary equipments of the project. There is no any other equipment providing auxiliary heat to the waste energy recovery process.

3. **The facility/s where the process heat in element process/steam/electricity/mechanical energy is used (the recipient plant(s)) and /or grid where electricity is exported, if applicable.**

   The electricity generated by the project activity will be supplied to the internal electricity system of SGIS, which is connected to South China Power Grid. The project activity will replace the electricity generated by South China Power Grid. Therefore, South China Power Grid, which includes Guangdong, Guangxi, Guizhou and Yunnan Gird, is included as project boundary. South China Power Grid has electricity importing from Central China Power Grid, so Central China Power Grid will be included into the physical boundary of the project.

Table B.1 Summary of gases and sources included in the project boundary and justification explanation where gases and sources are not included

	Source	Gas	Included?	Justification / Explanation
Baseline	South China Power Grid	CO_2	Yes	Main emission source.
		CH_4	No	According to the methodology ACM0012, CH_4 is excluded for simplification. This is conservative.
		N_2O	No	According to the methodology ACM0012, N_2O is excluded for simplification. This is conservative.
	Fossil Fuel consumption in boiler for thermal energy	CO_2	No	Not applicable.
		CH_4	No	Not applicable.
		N_2O	No	Not applicable.
	Fossil Fuel consumption in cogeneration plant	CO_2	No	Not applicable.
		CH_4	No	Not applicable.
		N_2O	No	Not applicable.
	Baseline emissions from generation of steam used in the flaring process, if any	CO_2	No	Not applicable.
		CH_4	No	Not applicable.
		N_2O	No	Not applicable.
Project Activity	Supplemental fossil fuel consumption at the project plant	CO_2	No	There is no fossil fuel consumption at the project plant
		CH_4	No	There is no fossil fuel consumption at the project plant
		N_2O	No	There is no fossil fuel consumption at the project plant
	Supplemental electricity consumption.	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Electricity import to replace captive electricity, which was generated using waste gas in absence of project activity	CO_2	No	Not applicable.
		CH_4	No	Not applicable.
		N_2O	No	Not applicable.
	Project emissions from cleaning of gas	CO_2	No	No cleaning of gas is required.
		CH_4	No	No cleaning of gas is required.
		N_2O	No	No cleaning of gas is required.

The flow diagram below physically delineates the project activity and its relevant information.

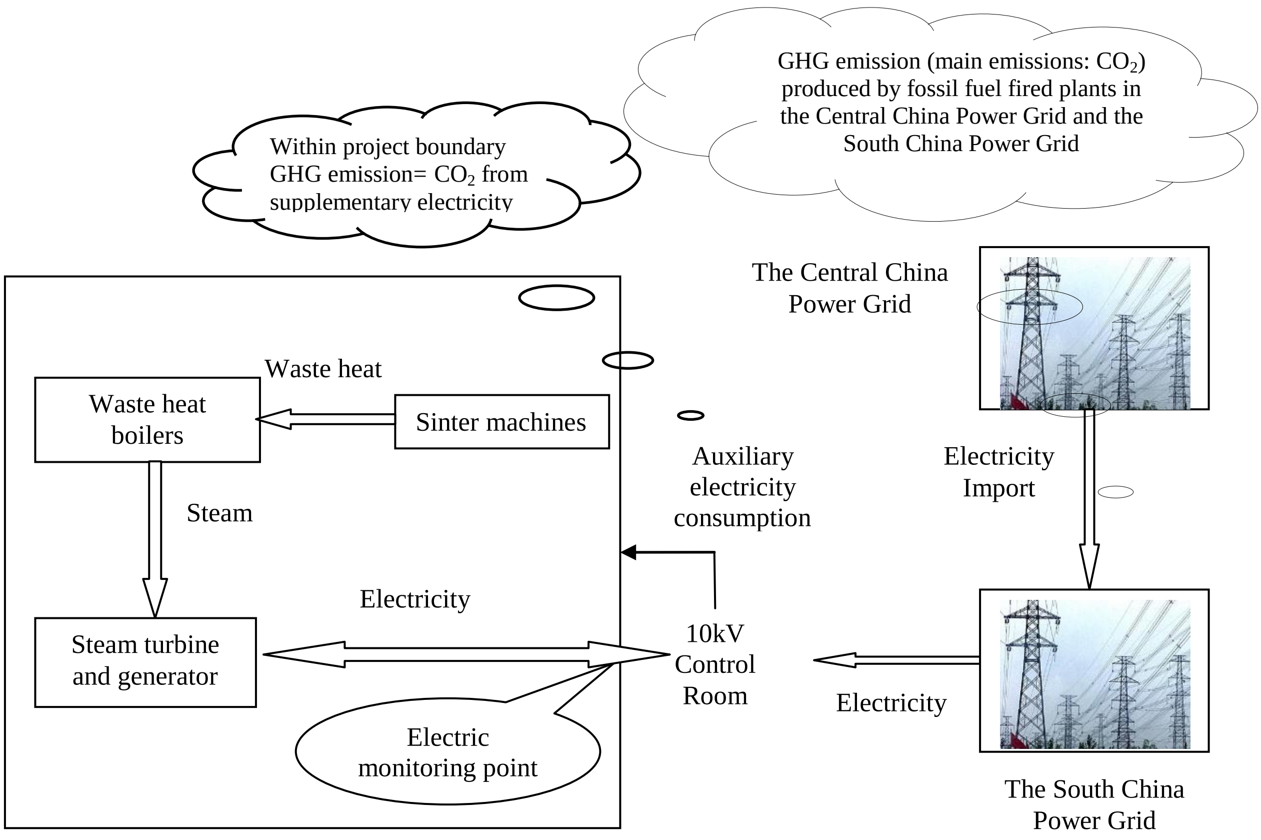

Figure B.1 Project Boundary

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

Identification of the baseline scenario

As described in methodology ACM0012, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).

Realistic and credible alternatives should be determined for:

- Waste energy use in the absence of the project activity; and
- Power generation in the absence of the project activity; and
- Steam/heat generation in the absence of the project activity; and
- Mechanical energy generation in the absence of the project activity.

For this project, the most plausible baseline scenario among all realistic and credible alternatives is:

- Waste heat use in the absence of the project activity; and
- Power generation in the absence of the project activity

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations:

The baseline candidates are considered for following facilities:

- the sintering machines where waste heat is generated; and
- the waste heat boilers, steam turbine, generator and all other equipments of the project where the electricity is generated; and
- The facility connected to the internal electricity system of SGIS where the electricity is consumed.

For the use of waste heat, the realistic and credible alternatives may include, *inter alia*:

W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized;
W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;
W3: Waste energy is sold as an energy source;
W4: Waste energy is used for meeting energy demand;
W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared;
W6: All the waste gas produced at the industrial facility is captured and used for export electricity generation.

For the scenario W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized;

WECM for this project is defined as flue gas, which carrying the waste energy in form of heat. Therefore, for the waste heat recovery project, the scenario W1 is the same as the scenario W2.

For the scenario W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;

The project does not involve the use of waste gas and waste pressure, but only waste heat. The waste heat utilized in the project is released to the atmosphere. W2 is in compliance with Chinese relevant laws and regulations and is also the status quo of the project in pre-project scenario. Therefore, the scenario W2 is available, and is the baseline scenario candidate.

For the scenario W3: waste energy is sold as an energy source;

This scenario is in compliance with all applicable legal and regulatory requirements in China. However, the sintering plant is far away from other industrial factories, there are no waste heat consumers, and it's impossible to sell the flue gas directly as energy source. Therefore, this scenario is not a credible and realistic alternative. Therefore, W3 is excluded from possible scenarios.

For the scenario W4: waste energy is used for meeting energy demand;

There is no energy demand for $360m^2$ sinter machines production line, if waste heat generated from sinter machines is used for meeting energy demand, which is similar with the project activity without applying for CDM project. This is in compliance with legal laws and regulations, but is not mandatory under the national and local governmental laws. Therefore, this scenario is a feasible baseline scenario candidate.

For the scenario W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared;

The project does not involve the recovery of waste gas. Therefore, scenario W5 is not a credible scenario.

For the scenario W6: All the waste gas produced at the industrial facility is captured and used for export electricity generation;

Based on the same reason with W5, scenario W6 is not a credible scenario.

From the above analysis we can conclude that the scenarios W2 and W4 may be available scenarios for the use of waste heat.

For power generation, the realistic and credible alternative(s) may include, *inter alia*:

P1: Proposed project activity not undertaken as a CDM project activity;
P2: On-site or off-site existing/new fossil fuel fired cogeneration plant;
P3: On-site or off-site existing/new renewable energy based cogeneration plant;
P4: On-site or off-site existing/new fossil fuel based existing captive or identified plant;
P5: On-site or off-site existing/new renewable energy or other waste energy based existing captive or identified plant;
P6: Sourced Grid-connected power plants;
P7: Captive Electricity generation using waste energy, which is able to provide the equivalent electricity with lower efficiency than the project;
P8: Cogeneration using waste energy, which is able to provide the equivalent electricity with lower efficiency than the project;
P9: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid;
P10: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export;
P11: Existing power generating equipment is maintained and additional electricity generated by grid connected power plants.

For the scenario P1: Proposed project activity not undertaken as a CDM project activity;

This scenario complies with the present laws and regulations, but it is not the mandatory project. Therefore, this scenario is a feasible baseline scenario candidate.

For the scenario P2: On-site or off-site existing/new fossil fuel fired cogeneration plant;

The project is to generate electricity only, according to ACM0012, the baseline should be only generation of electricity. Therefore P2 is not baseline scenario.

For the scenario P3: On-site or off-site existing/new renewable energy based cogeneration plant;

Based on the same reason with P2, P3 is not feasible baseline scenario.

For the scenario P4: On-site or off-site existing/new fossil fuel based existing captive or identified plant;

There is no fossil fuel based existing captive power plant in SGIS.

In addition, the average operation hours of thermal power plants in 2007 reached 5,344 hours[5], when considering the new thermal power plant with the equivalent annual power generation, the installed capacity of the plant should be 26.28MW. According to regulation of electricity regulation, it is prohibited to construct a fossil fuel power plant under 135MW [6]. Therefore, this scenario is not in compliance with the regulations and law of China.
In conclusion, the scenario P4 is not feasible baseline scenario.

For the scenario P5: On-site or off-site existing/new renewable energy or other waste energy based existing captive or identified plant

Regarding renewable energy:
There are no existing renewable energy plants around the project site, and it is impossible to build new renewable energy plant because:

- In the case of wind farms, this kind of project faces some barriers such as high investment [7], and it is necessary to apply for CDM for normal operation.
- In the case of hydropower project, the water resource is very short in Shaoguan City. [8] Therefore, it is impossible to build a hydropower project to provide equivalent electricity as the project.
- There is neither potential wave nor tidal energy in the project area, because the project is located far from the sea [9], and solar PV and geothermal energy are considered to be too expensive [10] [11] to generate equivalent annual output.
- In case of biomass resource, due to the uncertainty of fuel cost, this kind of project faces high risk [12], and is necessary to apply for CDM for normal operation.

Regarding other waste energy based plant:

Currently, there are two cogeneration plants, two TRT and two CDQ power plants implemented in SGIS, the two existing cogeneration plants generated heat and electricity by using the coal and waste gas. The two existing cogeneration plants have been started in 2001 and 2006 respectively both with 30 years operation period, therefore the remaining life time is more than 10 years of crediting period for the project. The two TRT generated electricity by using the waste pressure, and the two TRT plants have been started in 2007 and 2009 respectively both with 15 years operation period, therefore the remaining life time is more than 10 years of crediting period for the project. The two CDQ plants generated heat and electricity by using the wsste heat, and the two CDQ plants have been started in 2008 and 2009 respectively both with 20 years operation period, therefore the remaining life time is more than 10 years of crediting period for the project. However all the captive power plants can only supply 66% of the power demand of SGIS, and the proposed project can only supply 6.3% of the power demand of SGIS. Therefore, SGIS have to purchase power from the South China Power Grid. Further more, the energy source of the two cogeneration plants is coal and waste gas, the energy source of the two TRT plants is waste pressure, therefore the energy source of the two cogeneration plants and the two TRT plants are different from the

[5] China Electric Yearbook 2008, p.53
[6] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.
[7]http://ac.agri.gov.cn/ac/ViewContent.do?id=4affaa20110219f101116d279548047d&year=2007&month=3&right=!ENCODEtkc1vlOItllg1Oe
[8] http://www.cnki.com.cn/Article/CJFD2006-GDCX200604014.htm
[9] the Map of Guangdong province in Figure A.1
[10] http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=5884
[11]http://ac.agri.gov.cn/ac/ViewContent.do?id=4affaa20110219f101116d279548047d&year=2007&month=3&right=!ENCODEtkc1vlOItllg1Oe
[12]http://www.86ne.com/Biomass/200712/Biomass_103227.html

energy source of the proposed project. The energy source of the two CDQ plants are the same as the proposed project, however, the energy source of the two CDQ plants is from the process of coal quenching, the energy source of the proposed project is from the process of sintering, and the waste heat pipe of the CDQ plants and the proposed project is separated. Therefore, the project is impossible to replace the output of the six existing power plants. Furthermore, in case of two cogeneration plants and two CDQ power plants, the products of the cogeneration plants and CDQ power plants are electricity and heat, however, the project can only supply electrcity to the internal electricity system of SGIS. Therefore the implementation of the project activity will have no impact on the operation of the existing power plants, and these two cogeneration plants, two TRT projects and two CDQ power plants can not become the baseline scenario. Therefore, the onsite or offsite other waste energy-based existing captive or identified plant was excluded.

In conclusion, the scenario P5 is not the feasible baseline scenario.

For the scenario P6: Sourced Grid-connected power plants

The baseline scenario option is in compliance with Chinese relevant laws and regulations, and does not have financial barriers. This scenario P6 is a feasible baseline scenario candidate.

For the scenario P7: Captive Electricity generation using waste energy, which is able to provide the equivalent electricity with lower efficiency than the project;

If constructing new captive electricity generation plants with lower efficiency than the project to generate equivalent electricity, in order to supply the equivalent electricity, it will need more waste heat than the project. However, the proposed project will recover all the waste heat to generate electricity, furthermore, for the other sinter machines, No. 1,2,3,4 sinter machines had been eliminated. Hence, there is no addtional waste heat that can be utilized by the project activity. Therefore, it is impossible to generate the same power with lower efficiency than the project. Therefore, P7 is excluded from the baseline scenario.

For the scenario P8: Cogeneration using waste energy (if project activity is cogeneration with waste energy, this scenario represents cogeneration with lower efficiency than the project activity);

Based on the same reason with P2, P8 is not the baseline scenario.

For the scenario P9: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid

The project utilized waste heat for electricity generation which belongs to Type-1 projects. Therefore, the scenario P9 is not applicable.

For the scenario P10: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export;

Based on the same reason as P9, the scenario P10 is not applicable.

For the scenario P11: Existing power generating equipment is maintained and additional electricity is

generated by grid connected power plants.

Based on the same reason as P9, the scenario P11 is not applicable.

From the above analysis we can conclude that the scenario P1 and P6 are the plausible alternative scenarios to the project activity.

Conclusion

Therefore, the feasible baseline scenario candidates of this project are:

Waste energy	W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized
	W4: Waste energy is used for meeting energy demand
Power	P1: The proposed activity, not undertaken as a CDM project activity
	P6: South China Power Grid provides the equivalent electricity

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable.

The supply of fossil fuel as coal, oil, gas used in South China Power Gird is available in abundance in China and there is no supply constraint [13][14].

Step 3: Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).

The PDD uses the step 2 of the latest approved version of the "Tool for the demonstration and assessment of additionality" to identify the most plausible baseline scenarios by eliminating non-feasible options.

For the scenario W4: Waste energy is used for meeting energy demand

The waste heat can be used for meeting the energy demand as in the project activity, this is also in compliance with legal laws and regulations, but is not the mandated construction under the national or local governmental laws. This scenario is similar as the proposed project activity, without applying CDM. As indicated in Section B.5, without the consideration the revenue of CERs, the post-tax equity IRR is 9.49%, lower than the benchmark of Steel and Iron industry as 13%[15]. The result shows that the project activity lacks of commercial attraction. Therefore, the scenario W4 is not the baseline scenario.

For the scenario P1: The proposed activity, not undertaken as a CDM project activity

Based on the same reason as the scenario W4, the scenario P1 is not the baseline scenario.

Conclusion

Therefore, the baseline scenario of the proposed project is:

[13] http://nyj.ndrc.gov.cn/zywx/t20050810_40423.htm
[14] http://202.123.110.3/zwgk/2005-09/08/content_30251.htm
[15] Economic Evaluation Method and Parameter of Construction Projects, published by China NDAC and Ministry of Construction of China, 2006

Waste energy	W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized
Power	P6: South China Power Grid provides the equivalent electricity

STEP 4: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario.

Not applicable.

Conclusion:
The baseline scenario of this project is the combined scenario of W2 and P6, as Table B.2:

Table B.2 Combinations of baseline options and scenarios applicable to this project

Scenario	**Baseline options**		**Description of situation**
	Waste energy	Power	
1	W2	P6	The waste heat is released into the atmosphere without utilization, and the electricity is obtained from South China Power Grid.

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 additionality of the project activity is demonstrated by *the Tool for the Demonstration and Assessment of Additionality (Version 5.2)*, the specific steps as follows:

Below we provide a summarized implementation schedule of the project, illustrating the main events leading up to the start of operation. An overview of key events is given in Table B.3.

Table B.3 Overview of key events in the development of the project

Date	Key Events
September 2008	Feasibility Study Report (FSR) was compiled by Zhongye Changtian International Engineering Co., Ltd (hereafter referred as "ZCIE"). The IRR in FSR is lower than the benchmark, therefore ZCIE advised the project owner to apply CDM to overcome the investment barrier
January 8, 2009	Received the FSR Approval of the project from Guangdong Economic and Trade committee
March 1, 2009	Considering the advice of the ZCIE and smooth application process of two CDQ projects, SGIS made a decision for the project to apply for CDM.
July 29, 2009	The notification of intention to seek CDM status was submitted to NDRC
October 26, 2009	The notification of intention to seek CDM status was submitted to UNFCCC
December 18, 2009	Project Owner signed ERPA with Danish Energy Agency
January 29, 2010	The Engineering Procurement Contract (EPC) was signed (The starting date of the project activity)
May 1, 2011	The project activity will complete construction

In September 2008, the FSR of the project was complied by ZCIE, in the FSR it is shows that, the post-tax Equity IRR is lower than the benchmark 13%, therefore ZCIE advised the project owner to apply CDM to

overcome the investment barrier. Considering the advice of the ZCIE and smooth application process of two CDQ projects, SGIS made a decision for the project to apply for CDM on March 1, 2009.

After that, the notification of intention to seek CDM status was submitted to NDRC on July 29, 2009, and the notification of intention to seek CDM status was submitted to UNFCCC on October 26, 2009. Then with the support from Beijing Tianqing Power International CDM Consulting Co., LTD, the project owner reached ERPA with Danish Energy Agency on December 18, 2009.

Only after all these had been finished, the project owner signed the Engineering Procurement Construction (EPC) on January 29, 2010 and started to implement the project activity.

It can be concluded from Table B.3 that: the project owner was serious aware about the potential of CDM to support its activities prior to the implementation of the project, and CDM has played a decisive role in the successful implementation of the project, and that real and continues actions were taken to secure CDM status for the project activity in parallel with its implementation.

Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub-Step1a. Define alternatives to the project activity

The alternatives to the project activity are analyzed in Section B.4, the credible alternative of this project would be:

Alternatives	Description	
Waste energy	W2	Waste heat is released directly to the atmosphere without utilization
Power Generation	P6	The electricity is obtained from the grid

Sub-Step1b. Enforcement of applicable Laws and Regulations

According to section B.4, the scenario P4 is not in compliance with Chinese relevant laws and regulations, hence they are not feasible alternatives.

In conclusion, the alternatives W2 and P6 are in compliance with Chinese relevant laws and regulations, and not mandated by national or local regulations and laws. The project activity is in compliance with the prerequisite of additionality.

Step 2 Investment Analysis

Sub-step 2a. Determine appropriate analysis method

There are three options to carry out investment analysis in the additionality tool, they are: simple cost analysis (Option I), investment comparison analysis (Option Ⅱ) and benchmark analysis (Option Ⅲ). We choose option Ⅲ, i.e. benchmark analysis to this specific project since:

For Option Ⅰ*:* Since the proposed project will earn revenues from not only the CDM but also the electricity generation, the simple cost analysis method is not applicable
For Option Ⅱ*:* It is only applicable to the case that alternative baseline scenario is similar to the proposed

project. The alternative baseline scenario of the proposed project is to release waste heat to atmosphere and use the electricity from the grid, rather than a new investment project. Therefore option Ⅱ is not applicable either.

For Option Ⅲ*:* It is the key consideration for the Project Entity to compare the benchmark IRR with estimation of the project investment IRR, therefore, option Ⅲ is applicable for investment analysis of the proposed project. In addition, according to Guidance on the Assessment of Investment Analysis (Version 05), the paragraph 19 states "*if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate" and "the benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest".* This method has also been used in other PDDs of waste energy projects in China.

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

According to *the Economic Assessment method and Parameters for Construction Project, the third edition* published by NDRC and the Ministry of Construction P. R. China, the post-tax equity IRR of a Iron and Steel Industry project should not be lower than 13%.[16]

The core business of SGIS is the iron and steel production, and the electricity generated by the project will be used just for iron and steel production in SGIS (captive purpose) and without any power supply to the grid. Therefore, when making the decision on how to invest the additional investments, the opportunity costs and the financial feasibility estimation of projects shall be considered seriously, thus SGIS employs the benchmark of iron and steel industry as a guideline for the project. Therefore, the IRR benchmark 13% of iron and steel industry is applicable for the project.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

The attractiveness of the project without CDM revenues is measured by conducting an Internal Rate of Return (IRR) analysis. The basic parameters used for the post-tax equity IRR calculation are provided in Table B.4:

The FSR of the project was completed by ZCIE, which is a third entity that had obtained Grade A issued by the NDRC. As the FSR has been completed by an independent and certified institute and approved by Guangdong Economic and Trade committee, and the period between the FSR approval (January 8, 2009) and the CDM decision (March 1, 2009) is short, the FSR therefore can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation.

Table B.4 Basic Financial Parameters of the project [17]

Parameter	Value	Source
Installed Capacity	25MW	FSR

[16] The electricity generated by the project will be consumed in SGIS, and will not be transferred to the grid. SGIS, who is an iron and steel industry project owner, consider the project benchmark as iron and steel industry benchmark (13% for post-tax equity IRR) is reasonable.

[17] According to the *Economic Assessment method and Parameters for Construction Project, the third edition*, the input values in the investment analysis should use the "current" fixed data. The "current" means the time of the investment decision.

Annual Power Supplied	126,768MWh	
Static Total Investment	215,000,000Yuan RMB[18]	
Electricity Price (Including VAT)	0.5694Yuan RMB/kWh	
VAT	17%	
Education Surcharge	3%	
Urban Construction Surcharge	7%	
Residual Value Rate of Fixed Assets	5%[19]	
Income Tax	25%	
Operating Life	15 years	
Annual Operational Cost	26,653,000 Yuan RMB	
CERs Price	€8.35/tCO_2e (€1=9.80Yuan RMB)	ERPA

Table B.5 Post-tax Equity IRR of the Project

	Post-tax Equity IRR
Without CDM Revenue	9.49%[20]
With CDM Revenue	13.49%

According to calculation, without CDM revenue, the post-tax equity IRR is 9.49%, which is lower than the threshold rate of 13%. Based on the threshold revenue rate in the financial evaluation of the Chinese Iron and Steel industry, the post-tax equity IRR of an Iron and Steel industry project should not be lower than the threshold of 13%. Therefore, without CDM revenue, the project faces obvious financial barriers. But the post-tax equity IRR will achieve 13.49% with CDM revenue, which is higher than 13%. Therefore, the CDM revenue can improve the economical attraction of the project.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

Under reasonable variations in the critical assumptions, a sensitivity analysis was conducted to check whether the results of the analysis remain unaltered. The following critical assumptions have been used:

- Static Total Investment
- Annual Operational Cost
- Annual Power Supplied
- Electricity Price

Variations of ±10% [21] have been considered for the critical assumptions. Table B.6 summarizes the results of the sensitivity analysis.

Table B.6 Impact of Variations in Critical Assumptions on Post-tax Equity IRR

	-10%	-5%	0%	5%	10%
Static Total Investment	11.77%	10.58%	9.49%	8.47%	7.52%
Annual Operational Cost	9.63%	9.56%	9.49%	9.42%	9.35%
Annual Power Supplied	6.74%	8.14%	9.49%	10.80%	12.07%
Electricity Price	6.74%	8.14%	9.49%	10.80%	12.07%

[18] All the investment of this project is supplied by the project owner; there is no loan from the bank.
[19] Based on document Guoshuihan [2005]883, issued by the State Administration of Taxation on September 14 2005, residual value rate of 5% was employed.
[20] The Post-tax Equity IRR 9.59% in GSP PDD is based on residual value rate of 10%.
[21] Variation of 10% refers to FSR, which is also consistent with the special custom in financial analysis.

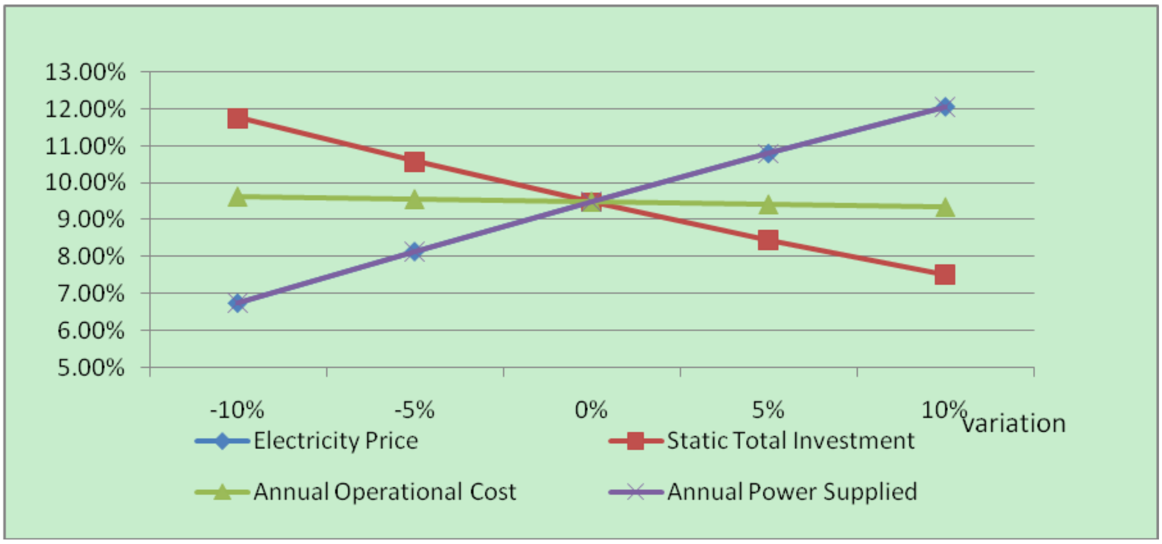

Fig. B.2 post-tax Equity IRR Sensitivity Analysis when Static Total Investment, Annual Operational Cost, Annual Power Supplied and Electricity Price changed

As shown in Fig. B.2, without CDM revenues, the post-tax equity IRR of the project is 9.49% which is far lower than the threshold of 13%. Without CDM revenues, when the Static Total Investment, Annual Operational Cost, Annual Net Power Supplied, and Electricity Price vary ±10%, the post-tax equity IRR of the project is still lower than 13%, thus the project is still lack of financial attractiveness.

When the benchmark reaches to 13%, the critical value of the critical assumptions is as follow:

	Static Total Investment	Electricity Price	Annual Operational Cost	Annual Power Supplied
Benchmark reach to 13%	critical value:-14.75%			
		critical value:+13.7%		
			critical value:-30.15%	
				critical value:+13.7%

Static Total Investment:

With a decrease in the static total investment by 10%, the post-tax equity IRR is 11.77%, still lower than 13%. When static total investment decreases by 14.75%, the post-tax equity IRR of the project can reach benchmark of 13%. However, the Producer Price Index (PPI) of industrial products had been increased by 2.3%, 6.1%, 4.9%, 3.0% and 3.1% respectively for 2003, 2004, 2005, 2006 and 2007 in China[22]. So it could hardly for investment to decrease by as much as 14.75%. Therefore, it could hardly for the project to become commercially attractive through decreasing of static total investment.

Electricity Price:

With an increase in the electricity price by 10%, the post-tax equity IRR of the project is 12.07%, lower than 13%. When electricity price increases by 13.7%, the post-tax equity IRR of the project can reach benchmark of 13%. However, the price employed by the PDD is 0.5694 (including VAT), which can be confirmed by the Guangdong Provincial Price Bureau (Yue Jia [2008]224). Furthermore, the electricity price changes are difficult to predict, and are out of the control of specific enterprises. The average annual electricity price increase rate from 2002 to 2007 is 2.22% is lower than the increase rate of annual operation & maintenance cost according to publicly accessible information (please refer to Table B.7). Therefore, it is unlikely for the project to become commercially attractive through an adjustment of the electricity price.

[22] http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm

Annual Operational Cost:

With the decrease of annual operational cost by 10%, the post-tax equity IRR is 9.63%, lower than the benchmark of 13%. When annual operational cost decreases by 30.15%, the post-tax equity IRR of the project can reach benchmark of 13%. The annual operation & maintenance cost mainly include overhaul cost, employee wage, materials cost and other expense[23]. The price of water, N_2, Salary and Materials are increasing according to 2002-2007 raw material price increase rate (please refer to Table B.7). A significant decrease in operational costs is highly unlikely to occur as costs have been rising in china in recent years.

Table B.7 Various Price Indexes Fluctuations (Last Year=100)

Item		2002	2003	2004	2005	2006	2007	Average
Electricity Price		100.8	100.9	102.4	104.2	102.8	102.2	2.22%
annual operation & maintenance cost	Water	100.1	107.4	109.7	115.0	111.9	104.3	8.1%
	N_2	97.6	102.3	107.7	106.8	100.7	103.2	3.1%
	Salary	115.1	113.3	114.8	115.4	114.5	120.4	15.6%
	Materials	97.7	104.8	111.4	108.3	106	104.4	5.43%

http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm

Annual Power Supplied:

With the increase of annual power supplied by 10%, the post-tax equity IRR is 12.07%, lower than the benchmark of 13%. When annual power supplied increases by 13.7%, the post-tax equity IRR of the project can reach benchmark of 13%. However, the annual power supplied is calculated base on all waste heat available from the 360m^2 sinter machines. According to the approved FSR, in the condition that all the waste heat will be utilized to generate electricity, it can only supply power of 126,768MWh, and there is no additional waste heat to utilize. Therefore, it is impossible for the project to become commercially attractive through increasing of annual power supplied.

In conclusion, without the consideration of the CERs revenues from the CDM project, the project is not economic attractive.

Step 3 Barrier analysis

The investment analysis above can demonstrate that the project is additional, and therefore step 3 is not necessary.

Step 4 Common Practice Analysis

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

According to the *tool for the demonstration and assessment of additionally*, any other activities that are operational and that are similar to the proposed project activity should be analyzed to enforce the conclusion in Step 2. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

Guangdong Province with an area of 177,900 km^2 is comparatively and considerably larger than many countries. Further more, the Guangdong Province is a coastal province while Yunnan, Guangxi and Guizhou are inland provinces, so the investment environment of Guangdong Province where the project is located is different from other provinces in South China Power Grid. Therefore, Guangdong Province

[23] It refers to other producing fee, management cost, training cost, travel cost, rent, etc.

where the project is located will be taken as an analysis area for common practice.

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

According to the *China Steel Yearbook 2001-2007,* which is the only official and authoritative public source regarding Iron and Steel industry in China, there is no similar project activities that have been in operation in Guangdong Province. And through research of internet website, no similar prorject has been noticed in Guangdong Province. Therefore, the project activity is first-of-kind in Guangdong Province.

Further more, there is no similar project in China which is not applying for CDM. All the other similar projects in China have already successfully been registered or are applying for CDM registration.

It can be concluded that the proposed project activity is not of common practice and without the support of CDM revenues it would not be implemented and the waste heat will be released to the atmosphere without utilization, electricity would be supplied by South China Power Grid. Therefore, it can be concluded that the project satisfies the additionality.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per methodology ACM0012 (version 3.2), the baseline emissions and project emissions together with emission reductions should be calculated with formulas below.

Calculation of Baseline emissions

Baseline emissions are given as:

$$BE_y = BE_{En,y} + BE_{flst,y} \quad \text{(Equation B.1)}$$

Where

BE_y Total baseline emissions during the year *y* in tons of CO_2;

$BE_{En,y}$ Baseline emissions from energy generated by project activity during the year *y* in tons of CO_2;

$BE_{flst,y}$ Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year). As the project only involves the utilization of waste heat, no fossil fuel is needed to flare the waste gas in the baseline scenario. Hence, $BE_{flst,y} = 0$.

So $BE_y = BE_{En,y}$

Baseline emissions for Scenario 1

Calculation of $BE_{En,y}$

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad \text{(Equation B.2)}$$

Where,

$BE_{Elec,y}$ Baseline emissions from electricity during the year y in tons of CO_2;

$BE_{Ther,y}$ Baseline emissions from thermal energy during the year y in tons of CO_2.

For the proposed project, there is only supply of electricity, thus, $BE_{Ther,y} = 0$

Baseline emissions from electricity ($BE_{electricity,y}$) that is displaced by the project activity:

$$BE_{Elec,y} = f_{cap} \times f_{wcm} \times \sum_{j} \sum_{i} (EG_{i,j,y} \times EF_{Elec,i,j,y}) \qquad \text{(Equation B.3)}$$

Where:

$EG_{i,j,y}$ is the quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from i^{th} source (*i* can be either grid or identified source) during the year y in MWh, and;

$EF_{Elec,i,j,y}$ is the CO_2 emission factor for South China Power Grid in tons CO_2e/MWh;

f_{wcm} is the fraction of total electricity generated by the project activity using waste energy. This fraction of the project is 1 because the electricity generation is purely from use of waste heat.

f_{cap} is the energy that would have been produced in project year y using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year y.

The ACM0012 Methodology requires the capping of baseline emissions irrespective of planned/unplanned or actual increases in output of plant, change in operational parameters and practices, etc. Due to technical limitations (i.e. high dust concentration in the air containing the waste heat and strong fluctuations in pressure and flow), direct monitoring of the waste heat could hardly be achieved, therefore, Method-1 and Method-2 are not applicable, Method-3 provided by the methodology will be used to cap baseline emission.

The proposed project activity is a "Case-1 type project" under this Method-3 as the energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases f_{cap} should be the ratio of maximum theoretical energy recoverable using the project activity waste heat recovery equipment and actual energy recovered under the project activity (using direct measurement). For estimating the maximum theoretical recoverable energy, manufacturer's specifications can be used. Alternatively, technical assessment can be conducted by independent qualified/certified external process experts such as chartered engineers.

Following equation will be used to estimate f_{cap}:

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}} \qquad \text{(Equation B.4)}$$

$Q_{OE,BL}$ is the energy that can be theoretically produced (MWh), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released in the absence of the CDM project activity.

According to the FSR compiled by ZCIE on September 2008, the electricity that can be theoretically produced is 140,417MWh, i.e. $Q_{OE,BL}$ =140,417*MWh*

$Q_{OE,y}$ is the quantity of actual output energy during the year y (in MWh), based on the FSR, the actual output energy can be estimated as 140,417MWh..

Therefore, the PDD apply a value of 1 for f_{cap} in subsequent calculations of emission reductions for simplification. The project entity will monitor the actual power recovered of the proposed project activity in accordance with the methodology and f_{cap} will be updated ex-post in case the actual power recovered exceeds the energy recovered which is theoretically available on the basis of the current baseline conditions.

Therefore, the baseline emission of this project is:

$$BE_{Elec,y} = EG_{i,j,y} \times EF_{Elec,i,j,y} \quad \text{(Equation B.5)}$$

As the baseline power generation is: the annual equivalent electricity, in the absence of the project would be supplied by South China Power Grid, thus $EF_{Elec,i,j,y}$ equals to $EF_{grid,CM,y}$. According to ACM0012, the "Tool to calculate the emission factor for an electricity system" will be employed to calculate baseline emission factors.
The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2e/MWh	Combined margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,BM,y}$	tCO_2e/MWh	Build margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,OM,y}$	tCO_2e/MWh	Operating margin CO_2 emission factor for grid connected power generation in year *y*

We calculate the OM Emission Factor on the basis of the *2009 Baseline Emission Factors for Regional Power Grids in China* renewed by the Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on July 2, 2009[24] but deviate at some points, which results in an OM Emission Factor of 0.9986tCO_2e/MWh, and the BM Emission Factor of 0.5772tCO_2e/MWh. Therefore, the Combined Baseline Emission Factor of South China Power Grid **c**orresponds to **0.7879**tCO_2e/MWh.

According to the *2009 Baseline Emission Factors for Regional Power Grids in China* renewed by the Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on July 2, 2009, the OM Emission Factor is 0.9987tCO_2e/MWh, and the BM Emission Factor of 0.5772tCO_2e/MWh. Therefore, the Combined Baseline Emission Factor of South China Power Grid corresponds to 0.78795tCO_2e/MWh.

We will use the lower combined margin emission factor of **0.7879**tCO_2e/MWh for conservative purpose that can be calculated based on the calculation of OM (0.9986) and BM (0.5772) in the PDD. The full process of the calculation of the emission factors and all underlying data are presented in Annex 3.

Baseline Emission Factor

According to the "Tool to calculate the emission factor for an electricity system" (version 2.2.0), the project participants shall apply the following seven steps to calculate the combined margin CO_2 emission factor for South China Power Grid.

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 emission factor.
Step 6. Calculate the combined margin (CM) emissions factor.

The Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$) calculation for South China Power Grid is calculated as follows:

24 *2009 Baseline Emission Factors for Regional Power Grids in China* was renewed by the Director's Office of the National Climate Change Coordination of NDRC (Chinese DNA) on July 2, 2009.

Step 1. Identify the relevant electricity systems

The Chinese DNA (Office of National Coordination Committee on Climate Change) has published a delineation of the project electricity system and connected electricity systems, which are used for the project, derived from the latest "*2009 Baseline Emission Factors for Regional Power Grids in China*", updated by the Chinese DNA on July 2, 2009.

The power generated by the project will replace the power generated by South China Power Grid. South China Power Grid is a regional grid, which consists of four sub-grids: the Guangdong, Guangxi, Guizhou and Yunnan Grids. Therefore, the project selects South China Power Grid for the calculation of Operating Margin emission factor.

In addition, there is net imported power to South China Power Grid from Central China Power Grid. Therefore, Central China Power Grid is considered as part of the relevant electric power system.

To determine the CO_2 emission factor(s) for net electricity imports from the Central China Power Grid, the tool provides four options:

a) 0tCO_2/MWh; or

b) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 (d) of the *Tool to calculate the emission factor for an electricity system*; or

c) The simple operating margin emission rage of the exporting grid, determined as described in step 4(a) of the *Tool to calculate the emission factor for an electricity system*, if the conditions for this method, as described in step 3 below, apply to the exporting grid; or

d) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 4 (b) of the *Tool to calculate the emission factor for an electricity system*.

The PDD will choose option c)

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

Option Ⅰ: Only grid power plants are included in the calculation.
Option Ⅱ:Both grid power plants and off-grid power plants are included in the calculation.

Based on the actual situation of China, the option Ⅰhas been chosen for the calculation (because the option Ⅱ aims to reflect that in some countries off-grid power generation is significant and can partially be replaced by CDM project activities).

Step 3. Select a method to determine the operating margin (OM)

The calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$) 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.

From 2003 to 2007, in the composition of gross annual generation power for South China Power Grid, the ratio of power generated by hydro-power and other low cost/compulsory resources is as following: 31.06% in 2003, 29.95% in 2004, 30.94% in 2005, 29.75 in 2006, and 29.28% in 2007[25] respectively, obviously far lower than 50%. Therefore, the simple OM is appropriate, because low cost/must run resources account for far less than 50% of the power generation in South China Power Grid in most recent years.

[25] Annex 3, Table 1

According to "Tool to calculate the emission factor for an electricity system" (Version 2.2.0), the Simple OM has been employed to calculate the OM.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, or
- Ex post option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required calculating 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 the 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.

Project participant employs "ex-ante" for its operation margin calculation.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The "Tool to calculate the emission factor for an electricity system" (Version 2.2.0) offers two options for calculating the Simple OM.

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

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

As the net electricity generation and a CO_2 emission factor of each power unit are not available in China, and the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, at the same time, off-grid power plants are not included in the calculation. So the project uses Option B for calculating the simple OM emission factor, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y})}{EG_y} \quad \text{(Equation B.6)}$$

Where

$EF_{grid,OMsimple,y}$: the simple operating margin CO_2 emission factor in year *y* (tCO_2e/MWh)

$FC_{i,y}$: the amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);

$NCV_{i,y}$: the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit), National fixed value;

$EF_{CO_2,i,y}$: the CO_2 emission factor of fossil fuel type i in year y(tCO_2/GJ), 2006 IPCC Guidelines for default values;

EG_y : net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);

i: all fossil fuel types combusted in power sources in the project electricity system in year y;

y: the relevant year as per the data vintage chosen in Step 3.

The average operating margin emission factor can be calculated using the full power supplied-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

The Operating Margin emission factors for 2005, 2006 and 2007 are calculated. The three-year average is calculated as a 3-year generation-weighted average of the emission factors. The Operating Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity.

Step 5. Calculate the build margin emission factor

In terms of the vintage of data, project participants can choose between one of the following two options:

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

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

Project participants have chosen Option 1, which requires the project participant to calculate the build margin emission factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available already built for sample group m at the time of PDD submission.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

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

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most

recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);

(c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f). In China, the steps (d), (e) and (f) can be ignored because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago.

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts [26] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

According to *"Tool to calculate the emission factor for an electricity system (Version 2.2.0)"*, the build margin emission factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{(Equation B.7)}$$

Where

$EG_{m,y}$: the net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh),

$EF_{EL,m,y}$: the CO_2 emission factor of power unit *m* in year *y* (tCO_2e /MWh).

The CO2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4(a) for the simple OM, using option A2.

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken, the following deviation accepted by EB as step 5:

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[26] This is in accordance with the Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at:
http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

- First, according to the statistical data of the most recent one year, determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in coal} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.8)

$$\lambda_{Gas} = \frac{\sum_{i \in gas} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.9)

$$\lambda_{oil} = \frac{\sum_{i \in oil} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.10)

Where:
$FC_{i,m,y}$**:** Amount of fuel i consumed by relevant power sources m in year(s) *y* (Mass or Volume unit);
$NCV_{i,y}$: Net calorific value (energy content) of fossil fuel type *i* (coal, oil and gas) in year *y* (GJ/Mass or Volume unit);
$EF_{CO_2,i,y}$: CO_2 emission factor of fossil fuel type *i* (coal, oil and gas) in year *y* (tCO_2e/GJ);
Coal, *Oil* and *Gas* is solid fuel, liquid fuel and gas fuel respectively.
See details of calculation in Table 12, Annex 3.

Sub-step 2: Calculate the emission factor of fuel-based generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$ (Equation B.11)

Where:
$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.
See details of calculation in Table 12, Annex 3.

A coal-fired power plant with a total installed capacity of 600 MW is assumed to be the commercially available best practice technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 322.50gce/kWh, which corresponds to an efficiency of 38.10% for electricity generation.

For gas and oil power plants a 200 MW combined cycle power plant with a specific fuel consumption of 246gce/kWh, which corresponds to an efficiency of 49.99% for electricity generation, is selected as commercially available best practice technology in terms of efficiency[27].

Sub-step 3: Calculate the Building Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad \text{(Equation B.12)}$$

Where:

CAP_{Total}: the total capacity addition; and $CAP_{Thermal}$: the total thermal (coal, oil and gas) power capacity addition.

As mentioned above, the Build Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period.

The data resources for calculating OM and BM are:

- Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
  Source: *China Electric Power Yearbook* 2004-2008, *China Energy Statistical Yearbook* 2007, *Abstract of Electric Power Industry Statistics* 2006*;Compilation of Electric Power Industry Statistics 2007.*
- Fuel consumption and the net caloric value of thermal power plants
  Source: *China Energy Statistical Yearbook* 2006-2008,
- Carbon emission factor of each fuel
  Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 Energy, Table 1.4 of Page 1.23-1.24 in Chapter one.

Step 6. Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.
The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The PDD will choose option A.
The Baseline Emission Factor is calculated as follow:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \qquad \text{(Equation B.13)}$$

Where:

[27] The "*2009 Baseline Emission Factors for Regional Power Grids in China",* which has been renewed by the Chinese DNA (Director Office of National Climate Change Coordination of NDRC) on July 2, 2009.

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year *y* (tCO_2e/MWh);
$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year *y* (tCO_2e/MWh);
w_{OM} : Weighting of operating margin emissions factor (%);
w_{BM} : Weighting of build margin emissions factor (%).

According to the calculation above, the Operating Margin Emission Factor ($EF_{grid,OM,y}$) of South China Power Grid is **0.9986tCO$_2$e/MWh** and the Build Margin Emission Factor ($EF_{grid,BM,y}$) is **0.5772tCO$_2$e/MWh.** The defaults weights value during the fixed crediting period are used as specified in the "Tool to calculate the emission factor for an electricity system (Version 2.2.0)" ($w_{OM} = 0.5$; $w_{BM} = 0.5$)

Using above mentioned values the Combined Baseline Emission Factor ($EF_{grid,CM,y}$) of South China Power Grid in the first crediting period corresponds to **0.7879tCO$_2$e/MWh**.

Calculation of project emission

Project Emission PE_y

Project Emissions include emissions due to (1) combustion of auxiliary fuel to supplement waste heat and (2) electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption; and (3) emissions due to consumption of imported electricity that in the absence of project activity would have been supplied by captive electricity generated (only for Type-2 project activities).

$$PE_y = PE_{AF,y} + PE_{EL.y} + PE_{EL,\mathrm{Im}port,y}$$ (Equation B.14)

Where:
$PE_{AF,y}$ is the project activity emissions from on-site consumption of fossil fuels by the power plant(s), in case they are used as supplementary fuels, due to non-availability of waste energy to the project activity or due to any other reason. This project involves the recovery of waste heat for power generation, and will not use fossil fuels, therefore $PE_{AF,y}$ =0.

$PE_{EL,y}$ is electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption. There is no use of waste gas in the project, so there is no consumption of electricity in gas cleaning, but there are project emissions from on-site consumption of electricity for other supplementary electricity consumption.

The equation is as following:

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO_2,EL,y}$$ (Equation B.15)

Where:
$EC_{PJ,y}$ is the additional electricity consumed in y year as a result of the implementation of the project activity;
$EF_{CO_2,EL,y}$ is the emission factor of the electricity consumption in y year.
If electricity is purchased from the grid, the CO_2 emission factor for electricity ($EF_{CO_2,EL,y}$) may be

determined by one of the following options:
• Use a default emission factor of 1.3 t CO_2e/MWh;
• Use the combined margin emission factor, determined according to the latest approved version of the "Tool to calculate the emission factor for an electricity system".
In this PDD, we use the second option to calculate the $EF_{CO2,EL,y}$, therefore, $EF_{CO2,EL,y} = EF_{grid,CM,y}$.
In conclusion, $PE_{EL,y} = EC_{PJ,y} \times EF_{grid,CM,y}$.
$EC_{PJ,y}$ is additional electricity consumed in year y as a result of the implementation of the project activity(MWh)
In conclusion, $PE_y = PE_{EL.y}$

Leakage

Based on the methodology ACM0012, the project will not produce the greenhouse gas emission caused by leakage, meaning $L_y = 0$

Emission Reduction ER_y

The emission reduction of this project is equal to the baseline emission.

$$ER_y = BE_y - PE_y \quad \text{(Equation B.16)}$$

Where
ER_y is the total emissions reductions during the year y in tons of CO_2;
PE_y is the emissions from the project activity during the year y in tons of CO_2;
BE_y is the baseline emissions for the project activity during the year y in tons of CO_2.

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

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Generation of Power Sources j in (years) y (2003-2007, including Guangdong, Guangxi, Guizhou and Yunnan)
Source of data used:	*China Electric Power Yearbook 2004-2008* *China Energy Statistical Yearbook 2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$GEN_{import,y}$
Data unit:	MWh
Description:	The Power Transmitted from the Central China Power Grid to South China Power Grid in (years) y(2005-2007)
Source of data used:	*Abstract of Electric Power Industry Statistics 2005-2006 and Compilation of China Electric Power Industry Statistic 2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and	Official Statistical Data

procedures actually applied :	
Any comment:	To calculate the OM

Data / Parameter:	PR_y
Data unit:	%
Description:	The rate of electricity consumption of thermal power plants in year (s) y (2005-2007 including Guangdong, Guangxi, Guizhou and Yunnan)
Source of data used:	*China Electric Power Yearbook 2006-2008*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$FC_{i,y}$
Data unit:	10^4t or 10^8m^3
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year y (2005-2007, including Guangdong, Guangxi, Guizhou and Yunnan)
Source of data used:	*China Energy Statistical Yearbook 2006-2008*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ fuel in a mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	*China Energy Statistical Yearbook 2008*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i,j}$
Data unit:	t CO_2e/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in a mass or volume unit in year *y*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

Data / Parameter:	$\eta_{best,coal}$
Data unit:	%

Description:	The optimum commercial, coal-fired power supply efficiency
Source of data used:	*Chinese DNA: Notice on announcing 2009 Baseline Emission Factors for Regional Power Grids in China*
Value applied:	38.10%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$\eta_{best,oil/gas}$
Data unit:	%
Description:	The optimum commercial, oil and gas power supply efficiency
Source of data used:	*Chinese DNA: Notice on announcing 2009 Baseline Emission Factors for Regional Power Grids in China*
Value applied:	49.99%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The Install Capacity of Power Sources j in year y (2005-2007, including Guangdong, Guangxi, Guizhou and Yunnan)
Source of data used:	*China Electric Power Yearbook 2006-2008*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate BM

Data / Parameter:	$Q_{OE,BL}$
Data unit:	MWh
Description:	Output/intermediate energy that can be theoretically produced to be determined on the basis of maximum recoverable energy from the WECM, which would have been released in the absence of CDM project activity
Source of data used:	FSR
Value applied:	140,417MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The FSR was compiled by ZCIE, which had obtained the required license for the preparation of these types of feasibility studies
Any comment:	/

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

Baseline emission

Based on the Annex 3, in the crediting period, the baseline emission factor ($EF_{grid,CM,y}$) is 0.7879tCO_2e/MWh. Under the full load of operation, the electricity supplied to internal electricity system of SGIS is 126,768MWh. Therefore, the annual average baseline emissions of South China Power Grid supply equivalent electricity during the crediting period are:

$$BE_y = EG_{i,j,y} \times EF_{grid,CM,y} = 126{,}768\text{MWh} \times 0.7879\text{t}CO_2\text{e/MWh} = 99{,}880\text{t}CO_2\text{e}$$

Project Emission

According to *calculation process in section B.6*, the project emission is calculated as follows: $PE_y = PE_{EL,y}$

As the auxiliary electricity consumption from the SGIS internal electricity system is estimated as 0MWh [28]. Therefore,

$$PE_y = PE_{EL,y} = PE_{EL,y} = EC_{PJ,y} \times EF_{grid,CM,y} = 0$$

Emission Reduction

According to *B.6.1*, the annual average emission reduction of this project is equal to the baseline emission minus project emissions in the crediting period, therefore, the annual emission reduction is:

$$ER_y = BE_y - PE_y = EG_{i,j,y} \times EF_{grid,CM,y} - EC_{Pj,y} \times EF_{grid,CM,y} = 99{,}880 \text{ t}CO_2\text{e}$$

In crediting period, the annual average emission reduction is 99,880 tCO_2e

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

The total emission reductions of the project are 998,800t CO_2e.

Table B.7 Estimate of Emission Reductions in the crediting period

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Year1: 01/09/2011-31/08/2012	0	99,880	0	99,880
Year2: 01/09/2012-31/08/2013	0	99,880	0	99,880
Year3: 01/09/2013-31/08/2014	0	99,880	0	99,880
Year4: 01/09/2014-31/08/2015	0	99,880	0	99,880
Year5: 01/09/2015-31/08/2016	0	99,880	0	99,880
Year6: 01/09/2016-31/08/2017	0	99,880	0	99,880
Year7: 01/09/2017-31/08/2018	0	99,880	0	99,880
Year8: 01/09/2018-31/08/2019	0	99,880	0	99,880
Year9: 01/09/2019-31/08/2020	0	99,880	0	99,880
Year10: 01/09/2020-31/08/2021	0	99,880	0	99,880
Total (tonnes of CO_2e)	0	998,800	0	998,800

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

[28] The auxiliary electricity consumption is estimated to be 0 here for simplification and the actual data will be used in the verification period.

B.7.1. Data and parameters monitored:

In order to calculate baseline emissions, we need to monitor the following data:

- The power supplied to the SGIS internal electricity system ($EG_{i,j,y}$), for the purpose of baseline emission calculation;
- The auxiliary electricity consumption from the SGIS internal electricity system ($EC_{PJ,y}$)
- The Quantity electricity generated in year y ($Q_{OE,y}$), for the purpose of f_{cap} calculation.

Data / Parameter:	$EG_{i,j,y}$
Data unit:	MWh
Description:	Power supplied to the SGIS internal electricity system in the years y
Source of data to be used:	Measurement records
Value of data applied for the purpose of calculating expected emission reductions:	The power supplied to the SGIS internal electricity system by the project is 126,768MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations.
Any comment:	Data will be measured at the entrance of SGIS internal electricity system (M_{4a}, M_{5a}) and the exit of the 10kV bus line of the project (M_{2a}, M_{3a}) for cross check

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Auxiliary electricity consumption from the SGIS internal electricity system in the years y
Source of data to be used:	Measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	The electricity used by the project is estimated as 0MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations.
Any comment:	Data will be measured at the entrance of SGIS internal electricity system (M_{4b}, M_{5b}) and the exit of the 10kV bus line of the project (M_{2b}, M_{3b}) for cross check

Data / Parameter:	$Q_{OE,y}$
Data unit:	MWh/year
Description:	Quantity of electricity generated (MWh) in year y
Source of data to be used:	Measurement records

Value of data applied for the purpose of calculating expected emission reductions:	140,417MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meter will be periodically checked according to the relevant national standards and regulations.
Any comment:	/

B.7.2. Description of the monitoring plan:

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the crediting period. This monitoring work is mainly carried out by SGIS Measurement and Control Department, SGIS Mechanism Power Department and SGIS Finance Department. All these departments above are subsidiary companies of SGIS, of which,

- SGIS Measurement and Control Department is responsible for operation monitoring of the main meter and the backup meters and recording relative data;
- SGIS Mechanism Power Department will take charge of checking the data and uploads the data to Enterprise Resource Planning (ERP) system.
- SGIS Finance Department will take charge of issuing electricity balance bill.

1. Monitoring Objective

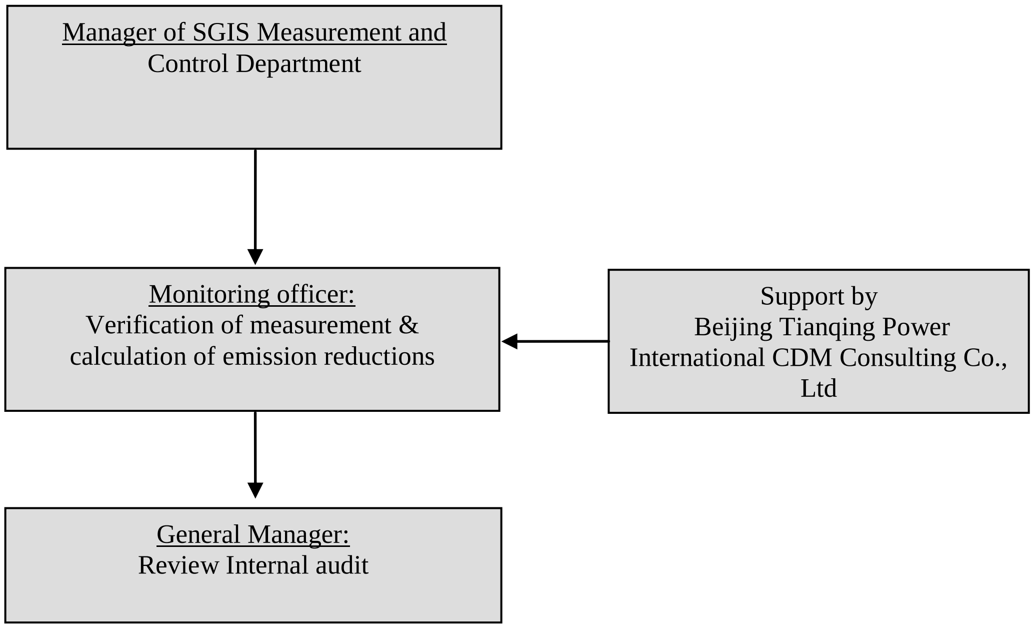
The main monitoring data are:

- The power supplied to the SGIS internal electricity system ($EG_{i,j,y}$), for the purpose of baseline emission calculation;
- Auxiliary electricity consumption from the SGIS internal electricity system($EC_{PJ,y}$), for the purpose of project emission calculation;
- The quantity electricity generated in year y ($Q_{OE,y}$), for the purpose of f_{cap} calculation.

2. Monitoring Organization

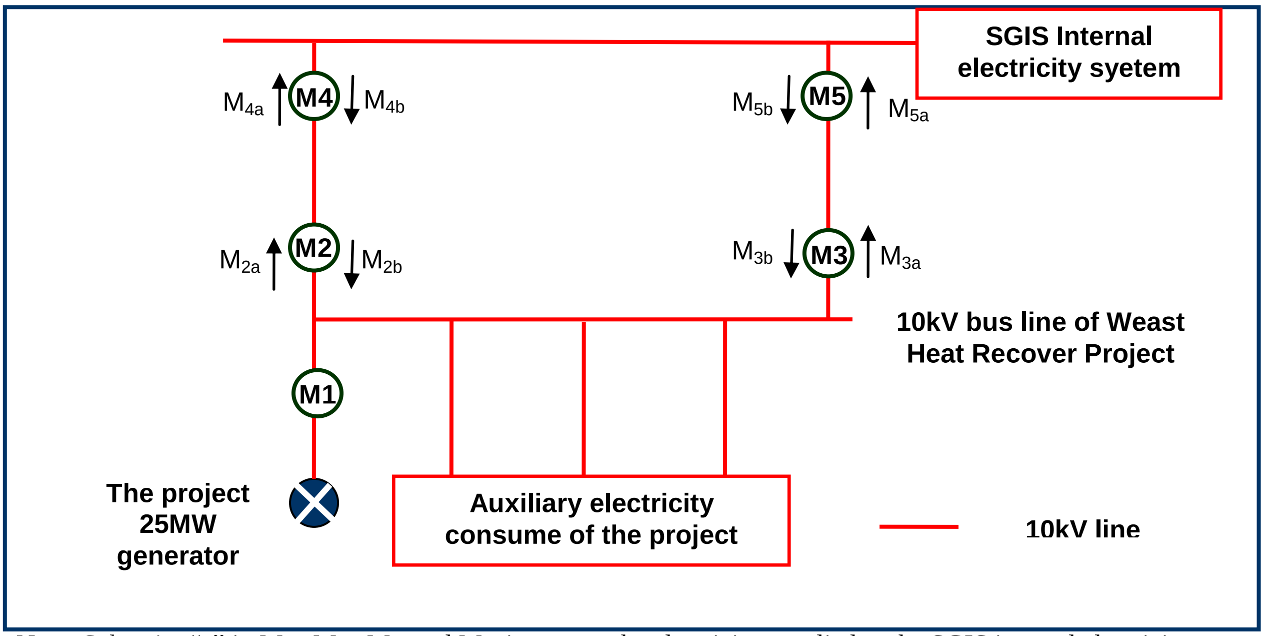
A chief monitoring officer will be appointed by SGIS to supervise and verify metering and recording, collect data (meter’s data reading, balance bills), calculates emission reductions and prepares a monitoring report.

The monitoring officer will receive the training and technical supports from Beijing Tianqing Power International CDM Consulting Co., Ltd.



3. Monitoring Equipment and program

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448－2000)*, the meters will be properly configured and checked annually.



Note: Subscript "a" in M_{4a}, M_{5a}, M_{2a} and M_{3a} is to state the electricity supplied to the SGIS internal electricity syetem, subscript "b" in M_{4b}, M_{5b}, M_{2b} and M_{3b} is to state auxiliary electricity consumption from the SGIS internal electricity system.

Fig. B.3 the meter location of the prject

M_1 (0.5 or more accuracy, main meter) located at the exit of the generator will be employed to monitor the electricity generated by the project activity (M_1). M_4, M_5 (0.5 or more accuracy, main meters, bi-directional) located at the entrance of the SGIS Internal electricity syetem are used to measure electricity

supplied to the SGIS internal electricity system (M_{4a}+M_{5a})[29] and auxiliary electricity consumption from the SGIS internal electricity system (M_{4b}+M_{5b})[30]. M_2, M_3 (0.5 or more accuracy, back-up meters, bi-directional) located at the exit of the 10kV bus line of the project, which are back-up meter of M_4, M_5 respectively.

Therefore, the electricity can be recorded as follows:

$$EG_{i,j,y} = M_{4a}+M_{5a}$$

$$EC_{PJ,y} = M_{4b}+M_{5b}$$

$$Q_{OE,y} = M_1$$

Therefore:

In normal case, the electricity supplied to the SGIS internal electricity system ($EG_{i,j,y}$) will be monitored by meter M_{4a}, M_{5a} and used to calculate baseline emission; the auxiliary electricity consumption from the SGIS internal electricity system ($EC_{PJ,y}$) will be monitored by M_{4b}, M_{5b} and used to calculate project emission; and the quantity electricity generated in year y ($Q_{OE,y}$) will be monitored by meter M_1 and employed for f_{cap} calculation.

In case the main meter is in trouble, the data monitored by the backup meters will be employed.

4. Data Collection:

SGIS Measurement and Control Department is responsible for operation monitoring of the main meter and the backup meters, SGIS Mechanical Power Department is responsible for check the data and upload the data to Enterprise Resource Planning (ERP) system.

The electricity recorded by the main meter alone will suffice for the purpose of billing and emission reduction verification as long main meter fault is within the permissible tolerance. The main monitoring process is as follows:

- i SGIS Measurement and Control Department will read and check the backup meters and the main meter and record the data at one appointed day of every month.
- ii The SGIS Mechanical Power Department checks the data and uploads the data to Enterprise Resource Planning (ERP) system.
- iii The SGIS Financial Department will make balance bills according to the Enterprise Resource Planning (ERP) system.

If inaccuracy of the reading data from the main meter exceeds the allowable tolerance or otherwise the meter malfunctions in one month, the electricity supplied by the proposed project or electricity imported by the internal electricity system of SGIS shall be followed by:

- i First, reading the backup meters to ensure electricity supplied to the internal electricity system of SGIS and electricity imported by the internal electricity system of SGIS, unless a test by either party reveals it is inaccurate;
- ii If the backup system is not within acceptable limits of accuracy or performed improperly, the SGIS Measurement and Control Department and the SGIS Mechanical Power Department shall jointly prepare a new agreement of the correct readings.

[29] The electricity supplied to the SGIS internal electricity system will be cross checked by the data measured at the exit of the 10kV bus line.

[30] The auxiliary electricity consumption from the SGIS internal electricity system will be cross checked by the data measured at the exit of the 10kV bus line.

In case of emergencies, the project owner will not claim emission reductions due to the project activity for the duration of the emergency. The project owner will follow the following procedure for declaring the emergency period to be over:

i The project owner will ensure that all requirements for monitoring of emission reductions have been re-established.

ii The SGIS Measurement and Control Department and the SGIS Mechanical Power Departmentwill both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

The meter reading will be readily accessible for the DOE. Calibration test records will be maintained for verification.

5. Calibration

The calibration of meters should be annually carried out according to relevant National electric industry standards or regulations.

All the meters installed shall be tested by the qualified metrical organization within 10 days after:

i The detection of a larger difference than the allowable tolerance in the readings of the main meter and the backup meters;

ii Repair to the faulty meter caused by improper operation.

6. Data Management

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM, and a hard copy printout will be archived. In addition, the project owner will collect electricity balance bills for the electricity delivered to the internal electricity system of SGIS and electricity imported from the internal electricity system of SGIS as a cross-check. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. electricity balance bills).

Physical documentation such as, paper-based maps and diagrams, will be collected, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the project owner. All data collected as part of monitoring plan will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

7. Monitoring Report

The monitoring report should include: the monitoring of the electricity supplied to the internal electricity system of SGIS, electricity imported by the internal electricity system of SGIS and the corresponding re-check report, emission reductions calculation report, repair records and calibration records of the monitoring equipment, and so on.

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)

Date of completion: 01/08/2011
Name of entity/persons determining the baseline:

Beijing Tianqing Power International CDM Consulting, Co., Ltd.

Tel: +86-10-62199416; 62199417

Fax: +86-10-62166196; 62164780

-Alex Yang:	General Manager:	aiminyang8201@yahoo.com.cn
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-Peter Hong:	Consultant:	peterhong@tqcdmchina.com.cn
-Tracy Yuan:	Consultant:	abeautytracytracy@yahoo.com.cn

All above persons are from Beijing Tianqing Power International CDM Consulting, Co., Ltd.

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:

29/01/2010 (The Engineering Procurement Construction was signed, the starting date of the project activity and earlier than GSP by the DOE.)

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

The expected operational lifetime of the project activity is 15 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:

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/09/2011 (The crediting period will not commence prior to the date of registration)

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

According to the relevant environmental laws and regulations, an Environmental Impact Assessment has been carried out and approved by the Environment Protection Administration of Shaoguan City. The main assessment conclusions are provided below:

Environmental Impact during Construction

The construction will be carried out at the 5# and 6# sintering plants sites, the total construction area is not large and it involves little earthwork. Thus little water and soil loss will be caused. Commercial concrete will be used and it will not be mixed at the construction site, so no construction waste water will be produced. The construction team will not live within the construction site; as a result, there will not be any domestic sewage. On the whole, the construction of this project will cause little impact on the environment.

Environmental Impact during Project Operation

1. Impact on the Air Environment Quality

This project generates electricity by recovering and utilizing the waste heat from sintering machines. It does not produce any waste heat or gas itself; moreover, it will not increase any sintering exhaust or polluting gases. Consequently, it causes little impact on the air environment quality.

2. Impact on the Water Environment

Turbine generators will not directly produce waste water. Except for turbine generators, waste heat boilers, chemical water stations, circulating water stations may produce a certain volume of waste water, but the waste water will not contain any poisonous elements or oil. The concentrations of compositions (i.e. CODcr, BOD_5、NH_3-N) are low. Domestic sewage produced by employees mainly contains CODcr、BOD_5、NH_3-N and it will be discharged together with construction waste water. The discharged waste water complies with the local standards of Guangdong 'Waste Water Discharge Limits' (DB4426-2001). According to requirements on discharge standards Level II, table 4 (please also refer to similar domestic mixed waste water discharge regulations, including waste water from chemical water stations, boilers and circulating cooling stations, and also domestic sewage from power plants.), the concentrations of waste water should be: CODcr concentration is around 40mg/L，BOD_5 concentration is around 15mg/L and SS concentration is around 40mg/L. All the generated waste water can be discharged after processing in the existing waste water processing system, after taking such measures it will lead to little environmental impact.

3. Noise Impact on Environment

The construction noise mainly comes from turbines, power generators, exciters, water pumps etc, and the noise also comes from the steam exhausting progress when boilers are started or under accident conditions. However the noise will be less than 95 dB (A). Following measures are taken:

1) Only those equipments which meet the National Urban Environmental Noise Standard will be adopted.
2) The control room will be equipped with acoustic windows and acoustic panels.
3) Sound insulation duty room will be built for employees who need to be on duty in high noise areas.
4) Relevant equipments will be equipped with acoustic enclosures to insulate or reduce the noise brought

by the noise resource.

5) A low noise cooling tower will be employed to reduce the operation noise.
6) Exhaust steam pipes of boilers will be equipped with mufflers.

By reducing and controlling the noise, this project will meet the environmental noise standards, and the noise impact on environment will be acceptable.

4. Thermal Pollution

By using the waste heat generated from the sintering circulating cooling stations, this project may reduce the thermal pollution.

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:

The project participants and the host party think that the project has very little negative impact on the environment.

SECTION E. Stakeholders' comments

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

A stakeholder consultation meeting on the project was conducted on March 10, 2010 in SGIS Hotel meeting room, Shaoguan City, Guangdong Province, to collect opinions from all of the potential stakeholders, such as local residents etc.

In order to ensure that all potential stakeholders receive the information concerning the meeting, the project owner publicized the meeting bulletin via the www.tqcdmchina.com website and also published a bulletin concerning the meeting of stakeholders in the *Shaoguan Daily* on March 5, 2010. In the bulletin, the company invited all the potential stakeholders to acquire the detailed information on the project of SGIS. Furthermore, at the meeting, the project owner invited the participants to express their comments and concerns about the project and the CDM. The main questions are as following:

1. Will the project bring more positive or negative impacts?
2. Will the construction of this station have positive influences on the local society, economy and the environment? What are the major positive impacts?
3. Will the construction of the project cause negative influences? If yes, what is the main influence?
4. Is there any noise, polluted gas from the project? Who will be seriously affected? Is there any way to solve the problems? Will the affected people accept them?
5. For the construction of this station, what is your most concerned aspect?
6. What is your suggestion on the construction and operation of this project as a stakeholder?
7. Are there any questions you would like to know regarding applying for CDM?
8. Do you object/support the construction of this project? Do you object/support this project applying for CDM?

E.2. Summary of the comments received:

Additionally, there are 35 investigation questionnaires given to the people who may be impacted by the proposed project and all the questionnaires have been received, the invited people are the stakeholders that may be affected by proposed project, including, local residents, and the workers of SGIS. 100% of them are older than 20.
1. 100% of the people have known the WHR at different levels.
2. 100% of the people think that the construction of the proposed project will bring positive impacts on local social society;
3. 100% of the people think that the construction of the project will not harm the local environment;
4. 100% of the people think that the construction of the project will utilize waste heat to reduce the emission of greenhouse as CO_2, and promote the environmental protection;
5.100% of the peoples think that the construction of the project will bring advantages for local people's life;
6. 100% of the peoples think that the construction of the project will not bring negative impacts on local people's living.
7. 100% of the people agree with the construction of the project.
8. 100% of the people agree with the project applying for CDM.

There are 30 stakeholders attended the stakeholder consulting meeting, including official government, SGIS workers and local residents. From the questionnaires and stakeholders' meeting, we can conclude

that all, local government and residents alike, agree with the construction of the project. The general opinions are:

During the construction period, the proposed project will bring noise and a little dust, but the construction area is located in the plant of SGIS, hence the negative influence is limited. The main influenced people are the workers of SGIS, who work near the construction plant. But the appropriate measures will be taken, so that the negative influence will be limited. As for the pollution caused by waste water, waste slag etc which the interviewed people concern most, the project owner will take a serious of preventing measures to reduce the negative influence.

In adverse, the implementation of this project will provide power to mitigate the gap of power demand and supply; provide more working opportunity for local residents. The resources utilized ratio could be increased, the energy loss could be reduced, and the environment could be protected and improved. On the other hand, this project could generate power through waste heat, replacing the relevant power of South China Power Grid, indirectly reduce the environment pollution of thermal power plants burning fossil fuel, contribute to the emission reduction of Greenhouse gas and protect the environment.

All stakeholders supported the development of the project, and the CDM project would actually facilitate the development of local economy and increase incomes of the local residents and support the construction of the project.

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

Comments received from questionnaires and stakeholders' meeting show that all stakeholders support construction of the plant. Local residents think there is a little impact on environment made by construction of the project; the project owner will take appropriate environmental protection measures strictly in EIA. No additional actions needed to solve the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

Organization:	SGIS Songshan Co., Ltd.
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Represented by:	Hongbo Yao
Title	Section Manager
Salutation:	Mr.
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The Buyer

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Represented by:	Søren Mensal Kristensen
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I countries used in the project activity.

Annex 3

BASELINE INFORMATION

Table 1. The ratio of power generated by hydro-power and other low cost/compulsory resources for the South China Power Grid, 2003-2007

	2003	2004	2005	2006	2007
Electricity Generation of Thermal power plant (MWh)	222,780,000	263,574,000	286,889,000	332,226,000	383,500,000
Electricity Generation of Hydro power plant and Other Power(MWh)	100,369,000	112,703,000	128,520,000	140,689,000	158,800,000
Total Electricity Generation of the South China Power Grid (MWh)	323,149,000	376,277,000	415,409,000	472,915,000	542,300,000
the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation	31.06%	29.95%	30.94%	29.75%	29.28%

Data Source: China Electric Power Yearbook 2004-2006, 2008, China Energy Statistical Yearbook 2007.

Table 2. Calculation of Thermal Power supplied to the South China Power Grid in 2005 and Imported Power

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	176,453,000	25,023,000	58,430,000	27,281,000
Rate of Electricity Consumption of Power Plant (%)[31]	5.58	7.95	6.94	7.34
Thermal Power Supplied to the Grid(MWh)	166,606,923	23,033,672	54,374,958	25,278,575
Total Thermal Power Supplied to the South China Power Grid (MWh)	269,294,127			
Net import power from the Central China Power (MWh)	20,264,000			
The total Power for the South China Power Grid (MWh)	289,558,127			

Data Source: China Electric Power Yearbook 2006, Abstract of Electric Power Industry Statistics 2005.

[31] Data of China DNA exchanges the value of Guizhou and Yunnan

Table 3. Calculation of Thermal Power supplied to the South China Power Grid in 2006 and Imported Power

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	188,429,000	27,967,000	76,039,000	39,791,000
Rate of Electricity Consumption of Power Plant (%)	5.27	4.45	6.06	4.12
Thermal Power Supplied to the Grid(MWh)	178,498,792	26,722,469	71,431,037	38,151,611
Total Thermal Power Supplied to the South China Power Grid (MWh)	314,803,908			
Net import power from the Central China Power (MWh)	21,730,840			
The total Power for the South China Power Grid (MWh)	336,534,748			

Data Source: China Electric Power Yearbook 2007, China Energy Statistical Yearbook 2007, Abstract of Electric Power Industry Statistics 2006.

Table 4. Calculation of Thermal Power supplied to the South China Power Grid in 2007 and Imported Power

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	215,700,000	36,100,000	84,300,000	47,400,000
Rate of Electricity Consumption of Power Plant (%)	6.01	7.42	6.62	7.23
Thermal Power Supplied to the Grid(MWh)	202,736,430	33,421,380	78,719,340	43,972,980
Total Thermal Power Supplied to the South China Power Grid (MWh)	358,850,130			
Net import power from the Central China Power (MWh)	24,237,240			
The total Power for the South China Power Grid (MWh)	383,087,370			

Data Source: China Electric Power Yearbook 2008, China Energy Statistical Yearbook 2008, Abstract of Electric Power Industry Statistic 2007.

Table 5. Calculation of average emission factor for Central China Power Grid from 2005 to 2007

	2005	2006	2007
Total CO_2 emission of the Central China Power Grid (tCO_2e)	332,420,496	378,031,235	419,013,395
The total power supplied to the Central China Power Grid (MWh)	286,203,305	337,056,176	380,239,080
Average emission factor (tCO_2e/ MWh)	1.16148	1.12157	1.10197

Table 6. 2005 data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4 Tons	6,696.47	1,435.00	3,212.31	1,975.55	13,319.33
Clean coal	10^4 Tons	0.00	0.00	0.00	0.15	0.15
Other washed coal	10^4 Tons	0.00	0.00	10.39	33.88	44.27
Coke	10^4 Tons	4.79	0.00	0.00	8.05	12.84
Coke oven gas	10^4 Tons	0.00	0.00	0.00	0.79	0.79
Other gas	10^8 Cubic meter	1.87	0.00	0.00	15.96	17.83
Crude oil	10^8 Cubic meter	10.91	0.00	0.00	0.00	10.91
Gasoline	10^4 Tons	0.68	0.00	0.00	0.00	0.68
Diesel oil	10^4 Tons	31.96	2.02	0.00	1.81	35.79
Fuel oil	10^4 Tons	887.21	0.00	0.00	0.00	887.21
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	4.92	0.00	0.00	0.00	4.92
Natural gas	10^8Cubic meter	0.93	0.00	0.00	0.00	0.93
Other petroleum products	10^4 Tons	1.70	0.00	0.00	0.00	1.70
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Other Energy	10^4 Tce	104.66	133.15	0.00	59.72	297.53

Data Source: China Energy Statistical Yearbook 2006.

Table 7. Calculation of the OM Emission Factor for the South China Power Grid in 2005

Fuel	Unit	Fuel Consumption in the South China Power Grid E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) H	CO_2Emission (tCO_2e) I= H*F*E*44/12/100 (in mass) I=H*F*E*44/12/10 (in volume)
Raw coal	10^4 Tons	13,319.33	87,300	20,908	243,113,522
Clean coal	10^4 Tons	0.15	87,300	26,344	3,450
Other washed coal	10^4 Tons	44.27	87,300	8,363	323,211
Coke	10^4 Tons	12.84	95,700	28,435	349,406
Coke oven gas	10^8 Cubic meter	0.79	37,300	16,726	49,287
Other gas	10^8 Cubic meter	17.83	37,300	5,227	347,626
Crude oil	10^4 Tons	10.91	71,100	41,816	324,367
Gasoline	10^4 Tons	0.68	67,500	43,070	19,769
Diesel oil	10^4 Tons	35.79	72,600	42,652	1,108,250
Fuel oil	10^4 Tons	887.21	75,500	41,816	28,010,178
LPG	10^4 Tons	0.00	61,600	50,179	0
Refinery gas	10^4 Tons	4.92	48,200	46,055	109,217
Natural gas	10^8Cubic meter	0.93	54,300	38,931	196,598
Other petroleum products	10^4 Tons	1.70	75,500	41,816	53,671
Other coking products	10^4 Tons	0.00	95,700	28,435	0
Other E (standard coal)	10^4 Tce	297.53	0	0	0
CO_2 emission of power import from the Central China Power Grid		1.16148×20,264,000= 23,536,307 tCO_2e			
Total emission (Q)		297,544,857 tCO_2e			
Total supply to the South China Power Grid (P)		289,558,127MWh			
OM Emission Factor in 2005 (=Q/P)		1.02758tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2008; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter,1 p.1.21- p. 1.22, Table 1.3.

Table 8 2006 Data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4 Tons	7,303.19	1,490.01	4,001.54	2,735.88	15,530.62
Clean coal	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Other washed coal	10^4 Tons	0.00	0.00	19.53	45.80	65.33
Briquettes	10^4 Tons	133.75	0.00	0.00	0.00	133.75
Coke	10^4 Tons	0.00	0.00	0.00	1.31	1.31
Coke oven gas	10^4 Tons	0.00	0.84	0.00	2.06	2.90
Other gas	10^8 Cubic meter	0.89	0.00	0.00	19.15	20.04
Crude oil	10^8 Cubic meter	0.87	0.00	0.00	0.00	0.87
Gasoline	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Diesel oil	10^4 Tons	29.92	1.26	0.00	3.00	34.18
Fuel oil	10^4 Tons	685.85	0.09	0.00	0.00	685.94
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Natural gas	10^8Cubic meter	7.92	0.00	0.00	0.00	7.92
Other petroleum products	10^4 Tons	0.67	0.00	0.00	0.00	0.67
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Other Energy	10^4 Tce	93.54	189.68	0.00	20.29	303.51

Data Source: China Energy Statistical Yearbook 2007.

Table 9. Calculation of the OM Emission Factor for the South China Power Grid in 2006

Fuel	Unit	Fuel Consumption in the South China Power Grid E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) H	CO_2 Emission (tCO_2e) I= H*F*E*44/12/100 (in mass) I= H*F*E*44/12/10 (in volume)
Raw coal	10^4 Tons	15,530.62	87,300	20,908	283,475,499
Clean coal	10^4 Tons	0.00	87,300	26,344	0
Other washed coal	10^4 Tons	65.33	87,300	8,363	476,968
Briquettes	10^4 Tons	133.75	87,300	20,908	2,441,296
Coke	10^4 Tons	1.31	95,700	28,435	35,648
Coke oven gas	10^8 Cubic meter	2.90	37,300	16,726	180,925
Other gas	10^8 Cubic meter	20.04	37,300	5,227	390,714
Crude oil	10^4 Tons	0.87	71,100	41,816	25,866
Gasoline	10^4 Tons	0.00	67,500	43,070	0
Diesel oil	10^4 Tons	34.18	72,600	42,652	1,058,396
Fuel oil	10^4 Tons	685.94	75,500	41,816	21,655,867
LPG	10^4 Tons	0.00	61,600	50,179	0
Refinery gas	10^4 Tons	0.00	48,200	46,055	0
Natural gas	10^8Cubic meter	7.92	54,300	38,931	1,674,251
Other petroleum products	10^4 Tons	0.67	75,500	41,816	21,153
Other coking products	10^4 Tons	0.00	95,700	28,435	0
Other E (standard coal)	10^4 Tce	303.51	0	0	0
CO_2 emission of power import from the Central China Power		1.12157×21,730,840 = 24,372,603 tCO_2e			
Total emission (Q)		335,809,186 tCO_2e			
Supply to the South China Power Grid (P)		336,534,748 MWh			
OM Emission Factor in 2006 (=Q/P)		0.99784 tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2008; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter1 p.1.21- p. 1.22, Table 1.3.

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Table 10. 2007 Data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4 Tons	8,214.78	1,750.63	4,298.80	3,170.79	17,435.00
Clean coal	10^4 Tons	3.46	0.00	0.00	0.00	3.46
Other washed coal	10^4 Tons	0.00	0.65	21.58	14.64	36.87
Briquettes	10^4 Tons	271.25	0.00	0.00	0.00	271.25
Coke	10^4 Tons	0.04	1.69	0.00	2.15	3.88
Coke oven gas	10^8 Cubic meter	0.00	0.96	3.19	1.80	5.95
Other gas	10^8 Cubic meter	0.00	30.77	0.00	21.63	52.40
Crude oil	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Gasoline	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Diesel oil	10^4 Tons	21.37	2.13	0.00	2.29	25.79
Fuel oil	10^4 Tons	467.97	0.41	0.00	0.00	468.38
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	0.37	0.00	0.00	0.00	0.37
Natural gas	10^8Cubic meter	32.17	0.00	0.00	0.00	32.17
Other petroleum products	10^4 Tons	8.47	0.00	0.00	0.00	8.47
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0
Other Energy	10^4 Tce	118.04	81.89	44.10	50.30	294.33

Data Source: China Energy Statistical Yearbook 2008.

Table 11. Calculation of the OM Emission Factor for the South China Power Grid in 2007

Fuel	Unit	Fuel Consumption in the South China Power Grid E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) H	CO_2 Emission (tCO_2e) I=H*F*E*44/12/100 (in mass) I=H*F*E*44/12/10 (in volume)
Raw coal	10^4 Tons	17,435.00	87,300	20,908	318,235,546
Clean coal	10^4 Tons	3.46	87,300	26,344	79,574
Other washed coal	10^4 Tons	36.87	87,300	8,363	269,184
Briquettes	10^4 Tons	271.25	87,300	20,908	4,951,041
Coke	10^4 Tons	3.88	95,700	28,435	105,584
Coke oven gas	10^8 Cubic meter	5.95	37,300	16,726	371,208
Other gas	10^8 Cubic meter	52.40	37,300	5,227	1,021,628
Crude oil	10^4 Tons	0.00	71,100	41,816	0
Gasoline	10^4 Tons	0.00	67,500	43,070	0
Diesel oil	10^4 Tons	25.79	72,600	42,652	798,596
Fuel oil	10^4 Tons	468.38	75,500	41,816	14,787,262
LPG	10^4 Tons	0.00	61,600	50,179	0
Refinery gas	10^4 Tons	0.37	48,200	46,055	8,213
Natural gas	10^8Cubic meter	32.17	54,300	38,931	6,800,588
Other petroleum products	10^4 Tons	8.47	75,500	41,816	267,407
Other coking products	10^4 Tons	0.00	95,700	28,435	0
Other E (standard coal)	10^4 Tce	294.33	0	0	0
CO_2 emission of power import from the Central China Power Grid		1.10197×24,237,240 = 26,708,797 tCO_2e			
Total emission (Q)		374,404,628 tCO_2e			
Supply to the South China Power Grid (P)		383,087,370 MWh			
OM Emission Factor in 2007 (=Q/P)		0.97733 tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2008; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter1 p.1.21- p. 1.22, Table 1.3.

According to electricity supplied to the grid of fire power, the OM of latest three years should be weighted average, so the weighted average OM is:

$EF_{grid,OM,y}$ =(297,544,857+335,809,186+374,404,628)/(289,558,127+336,534,748+383,087,370)

= 0.9986tCO_2e/MWh

Table12. Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission in 2007

Fuel		Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal	Average NCV (MJ/t,km3)	Emission Factor （$kgCO_2/TJ$）	CO_2 Emission (tCO_2e)	Ratio
Coal	Raw coal	10^4tons	8,214.78	1,750.63	4,298.80	3,170.79	17,435.00	20,908	87,300	318,235,546	-
	Clean coal	10^4tons	3.46	0.00	0.00	0.00	3.46	26,344	87,300	79,574	-
	Other washed coal	10^4tons	0.00	0.65	21.58	14.64	36.87	8,363	87,300	269,184	-
	Briquettes	10^4Tons	271.25	0.00	0.00	0.00	271.25	20,908	87,300	4,951,041	
	Coke	10^4tons	0.04	1.69	0.00	2.15	3.88	28,435	95,700	105,584	-
	Total	-	-	-	-	-	-	-	-	323,640,928	93.08%
Oil	Crude oil	10^4tons	0.00	0.00	0.00	0.00	0.00	71,100	41,816	0	-
	Gasoline	10^4tons	0.00	0.00	0.00	0.00	0.00	67,500	43,070	0	-
	Diesel oil	10^4tons	0.00	0.00	0.00	0.00	0.00	69,700	43,070	0	-
	Fuel oil	10^4tons	21.37	2.13	0.00	2.29	25.79	72,600	42,652	798,596	-
	LPG	10^4tons	467.97	0.41	0.00	0.00	468.38	75,500	41,816	14,787,262	-
	Other petroleum products	10^4tons	8.47	0.00	0.00	0.00	8.47	75,500	41,816	267,407	-
	Total	-	-	-	-	-	-	-	-	15,853,266	4.56%
Gas	Natural gas	10^7m^3	321.70	0.00	0.00	0.00	321.70	54,300	38,931	6,800,588	-
	Coke oven gas	10^7m^3	0.00	9.60	31.90	18.00	59.50	37,300	16,726	371,208	-
	Other gas	10^7m^3	0.00	307.70	0.00	216.30	524.00	37,300	5,227	1,021,628	-
	LPG	10^4tons	0.00	0.00	0.00	0.00	0.00	61,600	50,179	0	-
	Refinery gas	10^4tons	0.37	0.00	0.00	0.00	0.37	48,200	46,055	8,213	-
	Total	-	-	-	-	-	-	-	-	8,201,637	2.36%
Total		-	-	-	-	-	-	-	-	347,695,831	100%

Table13. Calculating of Emission Factor for Various Power Plant

	Variable	Power Supply Efficiency L	Emission Factor for Fuels (tc/TJ) I	Emission Factor (tCO_2e/MWh) O=3.6/L/1000*I *44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	38.10%	87,300	0.8249
Gas-fired Power Plant	$EF_{Gas,Adv}$	49.99%	54,300	0.3910
Oil-fired Power Plant	$EF_{Oil,Adv}$	49.99%	75,500	0.5437

The emission factor of thermal power is：

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.8018 tCO_2e/MWh$$

Table14. The Installed Capacity of the South China Power Grid 2005

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	35,182.6	4,931.2	4,758.4	9,634.8	54,507.0
Hydro power(MW)	9,035.7	6,085.3	7,993.1	7,233.0	30,347.1
Nuclear power(MW)	3,780.0	0.0	0.0	0.0	3,780.0
Wind power and other(MW)	83.4	0.0	0.0	0.0	83.4
Total (MW)	48,081.7	11,016.5	12,751.5	16,867.8	88,717.5

Data Source: China Electric Power Yearbook 2006.

Table15. The Installed Capacity of the South China Power Grid 2006

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	40,615	5,434	8,564	14,350	68,963
Hydro power(MW)	9,320	7,624	9,698	7,534	34,176
Nuclear power(MW)	3,780	0	0	0	3,780
Wind power and other(MW)	183	0	0	0	183
Total (MW)	53,898	13,058	18,262	21,884	107,102

Data Source: China Electric Power Yearbook 2007.

Table16. The Installed Capacity of the South China Power Grid 2007

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	44,710	9,310	10,630	15,960	80,610
Hydro power(MW)	10,110	10,440	11,580	8,210	40,340
Nuclear power(MW)	3,780	0	0	0	3,780
Wind power and other(MW)	250	0	0	0	250
Total (MW)	58,850	19,750	22,210	24,170	124,980

Data Source: China Electric Power Yearbook 2008.

Table17. The Calculation of BM Emission Factor for the South China Power Grid

	Installed Capacity in 2005	Installed Capacity in 2006	Installed Capacity in 2007	Capacity Addition of 2005-2007	Ratio of Capacity Addition
Thermal power(MW)	54,507	68,963	80,610	26,103	71.98%
Hydro power(MW)	30,347	34,176	40,340	9,993	27.56%
Nuclear power(MW)	3,780	3,780	3,780	0	0.00%
Wind power (MW)	83	183	250	167	0.46%
Total(MW)	88,718	107,102	124,980	36,263	100.00%
Ratio of installed capacity in 2007	70.99%	85.70%	100.00%	-	-

Therefore, the BM was calculated as $EF_{grid,BM,y} = 0.8018 \times 71.98\%$ =0.5772 tCO_2e/MWh

The OM is calculated as 0.9986tCO_2e/MWh, the BM is calculated as 0.5772tCO_2e/MWh. The baseline emission factor equal to the Combined Margin with equally weighted average of the Operating Margin emission factor and the Build Margin emission factor.

According to *Tool to calculate the emission factor for an electricity system*, the default weight of the power is:

$$w_{OM} = 0.5 \qquad w_{BM} = 0.5$$

So the Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) is 0.7879tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

The monitoring plan will monitor the electricity supplied to the internal electricity system of SGIS, the auxiliary electricity consumption from the SGIS internal electricity system and the total electricity generation of the project activity.
The relative information is in section B7.2.