



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02-in effect as of: 1 July 2004**

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

Project for HFC23 Decomposition at Changshu 3F Zhonghao New Chemical Materials Co. Ltd, Changshu, Jiangsu Province, China (Version 7, July 27, 2006)

A.2. Description of the project activity:

Located in Changshu City of Jiangsu Province, Changshu 3F Zhonghao New Chemical Materials Co. Ltd. (hereinafter referred to as “3F Zhonghao”) is a leading fluoro chemical enterprise in China with a site area of 228,900m² and more than 900 employees. The main products of 3F Zhonghao are HCFC22, HFC32, HFC125, HCFC142b, HFC152a, HFC227ea, TFP, and AHF. The HCFC22 production plant currently has two production lines (A and B) owned and operated by 3F Zhonghao with total annual production capacity of 40,000 tons (production line A and line B each has individual capacity of 20,000tons). 3F Zhonghao’s production has been increasing annually to meet increasing demand, with total annual production at 14,375.963 tons in 2002, 19,974.024 tons in 2003 and 30,979 tons in 2004. Meanwhile, 3F Zhonghao is in the process of expanding its TFE production capacity by adding a new third HCFC22 production line to increase total HCFC22 production capacity by 12,000 tons. The destruction of the HFC23 emissions from the new HCFC22 production line is, however, not included in the calculations of emission reductions for the project, since the applied AM0001/Version 03 methodology only covers the destruction of HFC23 waste streams from existing facilities.

HCFC22 (CHClF₂) is manufactured through the continuous, liquid-phase reaction of chloroform (CHCl₃) and hydrogen fluoride (HF) in the presence of a partially fluorinated antimony pentachloride catalyst (SbCl₅). HFC23 (CHF₃) is an inevitable by-product of the HCFC22 manufacturing process. HFC23 itself is not toxic, but it is a greenhouse gas (GHG) with a very high Global Warming Potential (GWP) (GWP_HFC23=11,700 in the IPCC Second Assessment Report). At present, there is no market of HFC23 and there is no regulation in China that controls HFC23 emissions, thus all of the HFC23 generated as a by-product of HCFC22 production in the country is directly emitted into the atmosphere.

As a result of implementing this CDM project, 3F Zhonghao will install an incineration facility to decompose HFC23 generated from the existing HCFC22 units into carbon dioxide (CO₂) and hydrogen fluoride (HF). This process effectively reduces the HFC23 emissions from the HCFC22 manufacture. The decomposition facility to be employed in this project will be imported from a foreign technology provider whose HFC23 destruction technology is reliable, efficient and well reputed. In the proposed project, the destruction process will decompose the HFC23 by heating it to more than 1200⁰C in a thermal oxidizer with air, steam and NG. The off-gas from the thermal oxidizer is then cooled down and neutralized before being vented to the atmosphere. During this HFC23 thermal destruction process, hydrofluoric acid (HF) with the concentration of 30% - 40% is produced. These HF by-products will be transported and sold to another company. The annual CO₂ emission due to the transport of HF is around 0.3 tCO₂e. This amount is very small and therefore estimated to be negligible.

In this proposed project, 3F Zhonghao plans to store HFC23 prior to the operation of incineration facility and after the project is registered. The project will capture and store HFC23 generated from the HCFC22 production line A and line B in containers. The stored HFC23 will be directly sent to the incineration facility for decomposition after the facility starts operation. Since the storage activity is set up specially for the proposed project, it would be appropriate for



the quantity of HFC23 stored and subsequently decomposed also be counted as part of this CDM project.

This proposed CDM project aims to contribute to the sustainable development in China in the following ways:

- The project can effectively reduce the HFC23 emissions into the atmosphere, so as to improve the regional environment and help mitigate global warming problem;
- The project can attract foreign investment and advanced technology into China to help it fulfill the target of sustainable development;
- The project can provide more employment opportunities to facilitate the harmonious and steady social development.
- According to China's "Measures for the Implementation and Management of CDM in China", 65% of the revenue by the CER acquired will be given to the Chinese government to support its "Sustainable Development Facility".

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)
People's Republic of China	Changshu 3F Zhonghao New Chemical Materials Co. Ltd	No
Netherlands	International Bank for Reconstruction and Development (Public Entity) as the Trustee of the First Tranche of the Umbrella Carbon Facility	Yes
Italy	International Bank for Reconstruction and Development (Public Entity) as the Trustee of the First Tranche of the Umbrella Carbon Facility	Yes
Spain	International Bank for Reconstruction and Development (Public Entity) as the Trustee of the First Tranche of the Umbrella Carbon Facility	No

Project Entity:

Shen Xuezhong
Changshu 3F Zhonghao New Chemical Materials Co. Ltd
Changshu, Jiangsu Province, China
Postcode: 215522
Tel: 86-512-52322006



Fax: 86-512-52627758
http://www.3f-cs.com
E-mail: caihui@3f-cs.com

Changshu 3F Zhonghao New Chemical Materials Co., Ltd is a subsidiary of Shanghai 3F New Chemical Materials Co., Ltd. When founded in 1975, the company's name was Changshu Refrigerants Company, and was changed to Changshu 3F Fluorochemical Industry Co., Ltd in 1993. In 2001, the present Changshu 3F Zhonghao New Chemical Materials Co., Ltd. was established. The company is specialized in technology development and the production of fluorocarbons and other special fluorine-containing chemicals. These products are widely used in refrigeration, foaming, fire-extinguishing, aerosol, coating, chemical intermediate etc. As the market for fluorine-containing products keeps growing, 3F Zhonghao will continue to expand its products to meet the demand of customers.

China signed the Kyoto Protocol on May 29, 1998 and ratified it on August 30, 2002.

Purchaser of CERs from the Project:

James Warren Evans
Carbon Finance Business
International Bank for Reconstruction and Development
1818 H Street NW, Washington
Postcode: 20433
Tel: 1-202-473-2928
Fax: 1-202-522-7432
http://www.carbonfinance.org
E-mail: wevans@worldbank.org

The First Tranche of the Umbrella Carbon Facility (UCF) is a trust fund established by the International Bank for Reconstruction and Development in its capacity as trustee on behalf of public and private Participants of the First Tranche of the UCF.

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.:

Jiangsu

A.4.1.3. City/Town/Community etc:

Changshu



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

3F Zhonghao is located in Jiangsu Hi-tech Fluorochemical Industrial Park in Haiyu town of Changshu city. The Hi-tech Fluorochemical Industrial Park has a total area of 15 square kilometers. The first stage of the industrial park (Industrial park I) has been built up. On the west side of Industrial park I, are the reserved land for building Industrial park II and III, which will cover another 10 square kilometers. The main businesses in the Fluorochemical Industrial Park are fluorochemicals, biochemicals, pharmaceuticals and performance polymers. Foreign chemical companies, like Arkema, Dupont and Daikin, have put investment into the Industrial Park. The plant site of 3F Zhonghao is located in Industrial Park I, 90km away from Hongqiao airport of Shanghai and 55 km away from Suzhou city. There is no residential area in the Industrial Park. The nearest residential area outside the Park is Fushan community, which is 2.5 km away from 3F Zhonghao. The proposed project will be located around the existing HCFC22 production facility at 3F Zhonghao plant site.

Figure1. Location of Changshu in Jiangsu



Figure2. Location of Fluorochemical Industrial Park in Changshu city



Figure3. Location of Changshu 3F Zhonghao New Chemical Materials Co. Ltd. in Haiyu town



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

The proposed project is categorized in Category 11: “Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride”

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

3F Zhonghao has two HCFC22 production lines (A and B), with 40,000 tons of production capacity annually.

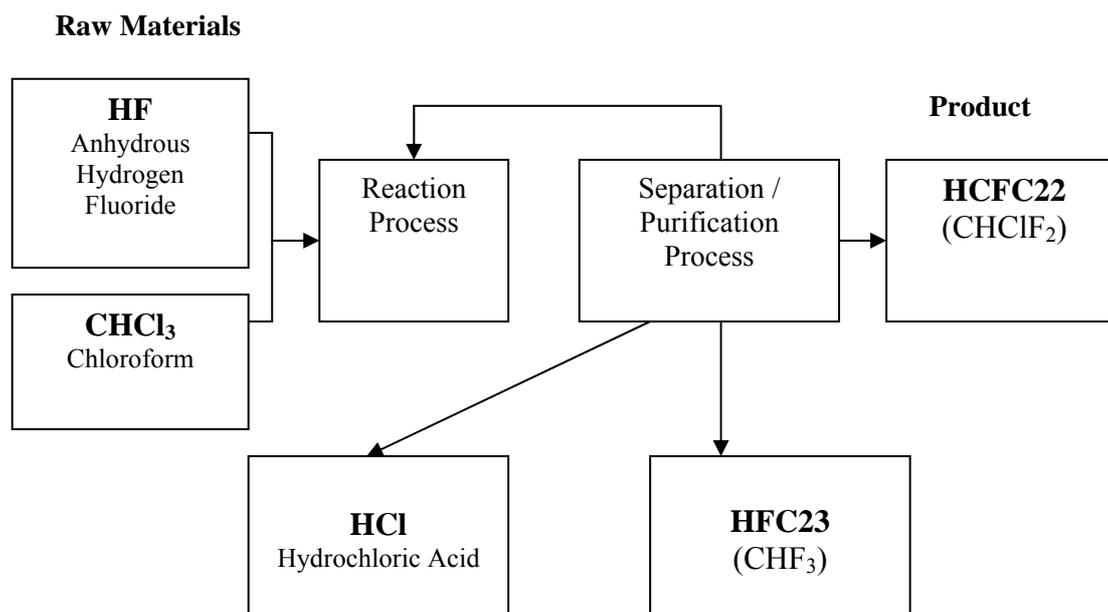
The main reaction in the HCFC22 Plant is:



The chemical reaction generating HFC23 in the HCFC22 Plant is:



Figure 4. Flow Diagram of HCFC22 and its by-product HFC23 Production Process

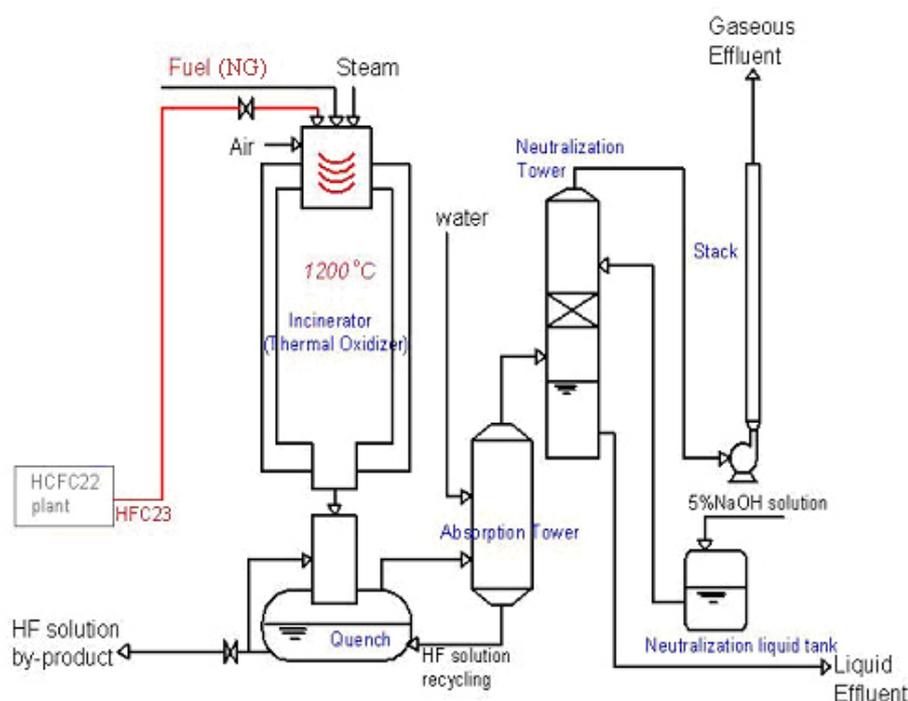
**Destruction technology to be employed by the project:**

The project will adopt a thermal decomposition technology to destruct HFC23 from a French company VICHEM. VICHEM is a leading supplier of advanced oxidation systems to destroy gas, liquid and solid waste. The company started its business in 1948 in technologies for the protection of the environment and specialized in the treatment of hazardous, very hazardous and halogenated waste. VICHEM’s thermal decomposition technologies have been successfully applied in Rhodia, UK (2003), Solvay, France (1991), Adisseo, France (2003) and Arkema, France (1992). Its reliability and high destruction efficiency have

been proved. So far, there are no advanced proven domestic technologies that are specialized in HFC23 destruction in China. Through the transfer of VICHEM's technology to the proposed project, not only the performance of HFC23 destruction process can be guaranteed, but also the relevant technical know-how can be transferred to China. Moreover, choosing an advanced technology for HFC23 destruction is also important in the sense that the technology employed by the project will not be substituted within the project period.

What follows is a detailed description of the VICHEM technology to be applied in the project:

Figure 5. HFC23 Thermal Destruction Process Flow Diagram



Thermal Oxidizer

HFC23 is fed to the thermal oxidizer directly from the HCFC22 process. In the thermal oxidizer, NG, combustion air coming from a combustion air fan and HFC23 waste stream will be fully mixed and form a high speed volute. The thermal oxidizer will be equipped with a speed controller to adjust oxygen excess.

The intensive mixed HFC23 waste stream, NG, and air will then be burned in a burner to form hot fumes (the temperature is higher than 1200 in the burner). The gases from the complete combustion enter a furnace (1200) which has a 2-second residence time. The furnace is not a flame zone but is used only for finishing off the last reactions. The decomposition rate of this process can reach 99.999%.

Quench

The flue gas leaving the thermal oxidizer is cooled in a quench. During the cooling process a circulating pre-cooled aqueous HF solution is used to quench the reaction and cool the flue gases to temperatures that



can be handled in the absorption tower (the temperature can drop from 1200 to 50 in 0.001 second). This process can avoid the generation of dioxin. The majority of acid gasses (HF and HCl) are absorbed into solution through this cooling process. Any unabsorbed acid gasses along with CO₂, N₂ (from the air) pass from the quench to the caustic scrubber.

Absorption tower

The remaining acid gasses along with CO₂, N₂ are fed to the bottom of an absorption tower. The acid gasses can be absorbed by soft water through this process. The diluted HF solution is recycled to quench where HF acid (concentration is 30%-40%) is produced and sent to existing storage for future use. CO₂ and N₂ will pass through the caustic scrubber before being vented into the atmosphere.

Neutralization tower

Fumes coming from the absorption tower will be sent to a neutralization tower where they are washed by caustic soda solution. Acid gasses will be removed after washing. The liquid effluent from neutralization tower can meet China's national wastewater discharge standard.

Exhaust stack

The tail gas from the neutralization tower will be transferred into an exhaust stack and finally emitted to the atmosphere. The gas emission can be fully in compliance with China's environmental standards and regulations.

In brief, this project will employ an advanced and clean technology with high burning efficiency and abatement efficiency, so that HFC23 emissions can be effectively reduced.

<p>A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:</p>

This project will result in the thermal decomposition of HFC23 with a high Global Warming Potential. (GWP=11700). Through the highly efficient incineration, the HFC23 can be converted to CO₂, a GHG with a much lower GWP (GWP_CO₂=1 in the second IPCC assessment Report). The technology to be adopted by the project can decompose 99.999% of HFC23, therefore almost all HFC23 in the plant can be destroyed by implementing this project.

Without this project, all the HFC23 produced by 3F Zhonghao will be emitted to the atmosphere without any recovery. The justifications for this assumption are listed below:

- China has so far no restrictions on the venting of HFC23 directly into the air, and there are also no plans to develop new regulations to control HFC23 emissions.
- The Montreal Protocol is now the only law implemented in China that impacts HCFC22. The Montreal Protocol stipulates that the HCFC22 production should be ceased by the year 2040 (HCFC22 as raw material is not limited by Montreal Protocol). Since the demand for HCFC22 as raw material for Polytetrafluoroethylene (PTFE) production keeps increasing, HFC23 will continue to be generated as a by-product of HCFC22 manufacture. At present, 3F Zhonghao is expanding its HCFC22 production capacity to meet the increasing demand for Tetrafluoroethylene (TFE). The new third HCFC22 production line will increase total HCFC22 production capacity by 12,000 ton.



However, the destruction of resulted HFC23 from the new HCFC22 is not included in the calculations within this PDD since the applied AM0001/Version 03 only covers the destruction of HFC23 from waste streams generated from existing facilities.

- The investment cost, operation cost and maintenance costs for HFC23 decomposition and storage facilities are very high, therefore, in the absence of the proposed project, HCFC22 manufacturers do not have any incentive to install the “high cost, no return” HFC23 decomposition and storage facilities. Furthermore, at present, the demand for HFC23 is very low in the market. 3F Zhonghao has not sold any HFC23 in the past and has no plans to do so in the future. As a result, there are no economic or financial incentives to destroy HFC23.
- 3F Zhonghao has neither the technology nor the plans to utilize HFC23 as a feedstock.

Due to the barriers described above the HFC23 emission would be released to atmosphere without the proposed CDM project. The project is therefore proven to be additional in accordance with the requirements for proving additionality outlined within AM0001/Version 03.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO₂ e
Year 2006 (October to December)	2,609,312
Year 2007	10,437,249
Year 2008	10,437,249
Year 2009	10,437,249
Year 2010	10,437,249
Year 2011	10,437,249
Year 2012	10,437,249
Year 2013	10,437,249
Year 2014	10,437,249
Year 2015	10,437,249
Year 2016	10,437,249
Year 2017	10,437,249
Year 2018	10,437,249
Year 2019	10,437,249
Year 2020	10,437,249
Year 2021	10,437,249
Year 2022	10,437,249
Year 2023	10,437,249
Year 2024	10,437,249
Year 2025	10,437,249
Year 2026	10,437,249
Year 2027 (January to September)	7,827,937
Total estimated reductions (tonnes of CO₂e)	219,182,229
Total number of crediting years	21 years
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	10,437,249

**A.4.5. Public funding of the project activity:**

No Official Development Assistance (ODA) Fund are used in this project

The sovereign participants of the First Tranche of the UCF confirm that any public funding used to participate in the First Tranche of the Umbrella Carbon Facility does not result in a diversion of official development assistance and is separate from and is not counted towards its financial obligations as a Party included in Annex I.

SECTION B. Application of a baseline methodology**B.1. Title and reference of the approved baseline methodology applied to the project activity:**

The baseline methodology employed by the thermal destruction of HFC23 at 3F Zhonghao HCFC22 production facility is the approved baseline methodology AM0001/Version 03 (“Incineration of HFC23 waste streams”).

The methodology is available on the UNFCCC website:
<http://cdm.unfccc.int/methodologies/PAMethodologies/approved.html>

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

AM0001/Version 03 is applicable to CDM projects that can satisfy the following conditions :

- a) The project occurs at an existing HCFC22 production facility;
- b) The HCFC22 production facility has at least three years of operating history between the beginning of 2000 and the end of 2004; and
- c) No regulation requires the destruction of the total amount of HFC23 in the host country.

The proposed project can meet all the three requirements above:

- a) The proposed project will decompose the HFC23 generated from the existing HCFC22 production facility at 3F Zhonghao.
- b) The HCFC22 production facility at 3F Zhonghao started operations in 2001 and has been in operation for more than three years. The facility has two production lines (A and B). The production of HCFC 22 was increased at the plant between 2001 and 2003 in response to increasing demand for HCFC22. As a result, the total annual production was 14,375.963 tons in 2002, 19,974.024 tons in 2003 and 30,979 tons in 2004.
- c) There is no regulation in China restricting HFC23 emissions at this moment or in the near future.

Therefore, AM0001/Version 03 baseline methodology is fully applicable to the proposed project.

B.2. Description of how the methodology is applied in the context of the project activity:

According to AM0001/Version 03 baseline methodology, the quantity of HFC23 to be fed to the thermal oxidizer will be measured accurately, and the emission reduction will be calculated by using the formula below:



$$ER_y = (Q_HFC23_y - B_HFC23_y) * GWP_HFC23 - E_DP_y - L_y$$

where:

ER_y is the total emission reduction generated by the project activity (t CO₂ e)

Q_HFC23_y is the quantity of HFC 23 generated from HCFC22 production facility (t)

B_HFC23_y is the quantity of HFC 23 to be destroyed by the regulation in China (t)

E_DP_y is the GHGs emissions by the decomposition process (t CO₂ e)

L_y is GHGs leakage due to the decomposition process (t CO₂ e)

In the above formula, the quantity of HFC23_y destroyed (Q_HFC23_y) is calculated as following:

$$Q_HFC23_y = q_HFC23_y * P_HFC23_y$$

Where:

q_HFC23_y is the quantity of HFC23 waste stream fed to the decomposition process

P_HFC23_y is the purity of HFC23 fed to the decomposition process

Baseline:

Considering that the proposed project needs to satisfy the additionality requirement, we introduce a baseline factor r_y related to the domestic regulation such as:

$$B_HFC23_y = Q_HFC23_y * r_y$$

r_y is the factor that reflects the restriction of the host country on HFC23 emissions. China does not limit HFC23 emissions, so $r_y = 0$.

Moreover, to exclude the possibility of manipulating the HCFC22 production process to increase the quantity of HFC23, Q_HFC23_y is limited to a fraction (w) of the actual HCFC22 production during the given year y .

According to the AM0001/Version 03 methodology there are three options for calculating the variable w :

1. "Direct measurement of HFC23 release is to be used where data are available, otherwise
2. Mass balance or other methods based on actual data are to be used. Uncertainty in emission rate estimates shall be quantified and conservative emission rate estimates shall be used when calculating expected emission reductions.
3. If insufficient data is available for calculating HFC23 emissions for all three most recent years up to 2004, then w is set at the default value of 1.5%.

Regardless of which option is followed it is stated that "The value of w is set at the lowest of the three historical annual values estimated as specified above and is not to exceed 3% (0.03 tonnes of HFC 23 produced per tonne of HCFC 22 manufactured)".

In this project a mass balance method (including carbon balance calculation and fluorine balance calculation) based on actual data has been used to calculate the value of w . During the calculation of w , uncertainty mainly comes from the estimation of HCFC22 leakage. Not all the HCFC22 leakage can be directly measured, such as the HCFC22 leakage due to catalyst replacement, taking sample for quality control and transferring HCFC22 to storage tank. The ratio of the HCFC22 leakage is roughly 0.13%. In order to ensure a conservative estimation, the ratio of HCFC22 leakage is set at 1% when calculating carbon and fluorine balance. Thus, based on a high estimate of HCFC22 leakage, the quantity of HFC23 obtained to calculate emission rate (HFC23/HCFC22) is also very conservative.



For the production line A at 3F Zhonghao, the emission rate (HFC23/HCFC22) are 3.62% (2002), 3.72% (2003), and 3.45% (2004). For the production line B at 3F Zhonghao, the emission rate (HFC23/HCFC22) are 3.68% (2002), 3.54% (2003), and 2.88% (2004). These values are the average of the two values obtained by carbon balance calculation and fluorine balance calculation. To be conservative again, we obtained for this project is the lowest value (2.88%), even though all the HFC23 generated from the two HCFC22 production lines at 3F Zhonghao will be sent to the thermal oxidizer for destruction.

Therefore, Q_{HFC23_y} needs to satisfy: $Q_{\text{HFC23}_y} \leq Q_{\text{HCFC22}_y} * w$ ($w = 2.88\%$).

Where Q_{HCFC22_y} is the maximum quantity of HCFC22 produced from the existing production facility during the last three years between 2000 and 2004 (The existing production facility includes two existing production lines but excludes a production line that started its operation in December 2004 in accordance with the methodology AM0001/Version 03). Since the annual production of HCFC22 at 3F Zhonghao in 2002, 2003 and 2004 are 14,375.963 tons, 19,974.024 tons and 30,979 tons respectively, the value of Q_{HCFC22} for this project is 30,979 tons per year.

To ensure conservativeness, in an ordinary year of project operation, even when the quantity of HFC23 generated by the project activity is more than $Q_{\text{HCFC22}_y} * w$, the accepted quantity of HFC23 remains equal to the calculation result of $Q_{\text{HCFC22}_y} * w$. Since the value of w in 2002, 2003, and 2004 are all higher than 2.88%, it is likely that the project will decompose more HFC23 than the quantity of HFC23 that can be certified. The additional decomposed HFC23 will make extra contribution to the global environment.

During the first few years of the project implementation, the quantity of HFC23 decomposed in the incineration facility might be more than the quantity of HFC23 destroyed in an ordinary year. In this case, the amount of HFC23 stored will be monitored and recorded separately, and the data will be provided to DOE for verification.

As mentioned in section A2 of this project design document, the third HCFC22 production line of 3F Zhonghao for producing TFE is not included in the proposed project. Only the destroyed HFC23 generated from production line A and line B will be considered this project. In order to prove that the proposed project activity will be fully in accordance with the above statement, 3F Zhonghao is willing to take a voluntary action by respectively adding two additional flow meters on production line A and line B to measure the HFC 23 generated from each production line. Thus, the sum of the two values obtained from flow meters on production line A and line B will be recorded and may be used as supporting data to ensure the validity of source and quantity of HFC23 fed to the thermal oxidation process.

Leakage:

Leakage is the indirect GHG emissions due to the project activity that occur outside the project boundary. The sources of leakage are:

- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of purchased electricity and steam
- CO_2 emissions due to transport of sludge to the landfill

Since the steam used by the project activity is the by-product of a sulphuric acid plant near 3F Zhonghao plant and it is not additionally generated for the project, we will not include steam consumption into the leakage estimation.



$$L_y = Q_Power_y * E_Power_y + ET_y$$

Where:

L_y (tCO₂e) is the sum of the emissions outside the project boundary in the given year y

Q_Power_y (kWh) is the quantity of power consumed by the thermal oxidation process.

E_Power_y is the emission factor that indicates CO₂ emissions generated per kWh of power consumed.

ET_y (tCO₂) is the amount of greenhouse gas emissions due to transport of sludge

Key information and data used to determine the baseline

Variable	Value	Data source
Q_HCFC22 (Maximum historical HCFC22 production at 3F Zhonghao between 2000 and 2004)	30979 ton	Provided by 3F Zhonghao
w (HFC23 generation rate at 3F Zhonghao)	2.88%	Provided by 3F Zhonghao
Q_HFC23 _y (Quantity of HFC23 to be fed to the destruction process)	892.19	Calculated by Q_HCFC22 * w
GWP_HFC23 (Global Warming Potential value of HFC23)	11700	IPCC Second Assessment Report
EF (Emission factor of HFC23)	0.62857ton CO ₂ / ton HFC23	AM0001/Version 03
E_NG (CO ₂ emission factor of NG consumed by the project)	2.75 ton CO ₂ / ton NG	Provided by 3F Zhonghao
E_Power (CO ₂ emission factor of East China Grid power consumed by the project)	1.02*10 ⁻³ ton CO ₂ / kwh	Calculated from data of East China Grid and IPCC default value

B.3. 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:

To date, there is no market of HFC23 in China and 3F Zhanghao does not have a technology to utilize HFC23. Therefore, all of the HFC23 is released to the atmosphere without any recovery. The project aims to destroy such HFC23 by incineration. Basically, the destroyed quantity of HFC23 is claimed as emission reductions.

Due to the following two reasons, the HCFC22 manufacturers in China have no incentive to install any facility for HFC23 emission control.

First, since China has no regulation that limits the emission of HFC23, the HCFC22 plants in China are not required to install thermal decomposition facility. In the absence of the facility, HFC23 is directly vented to the atmosphere.

Second, installation of the thermal decomposition facility, as well as the storage facility, in 3F Zhonghao will require large amount of investment cost, operation cost and maintenance cost, while there is no economic return from the facility installation. Therefore, in the absence of regulation on limiting HFC23, the HFC22 plants in China have no incentive to install high cost decomposition and storage facilities for GHG abatement.

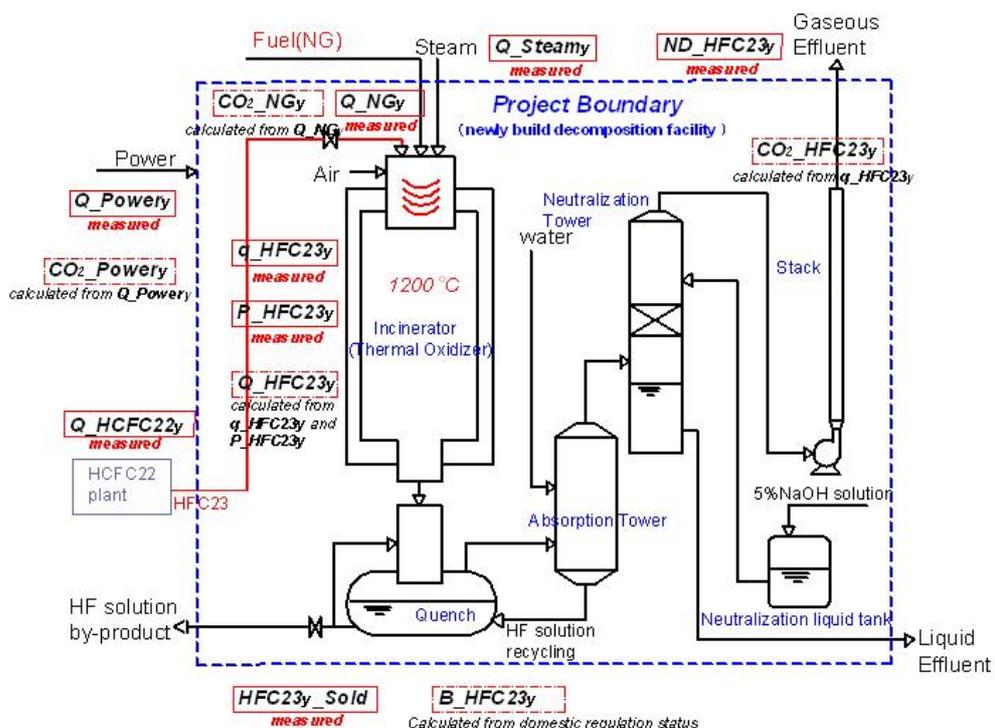
Moreover, in order to avoid the possibility of increasing the quantity of HFC23 through manipulating the HCFC22 production process, the project has set a “cut-off rate” (w) to define the maximum HFC23 production that can be recognized. In the case of 3F Zhonghao, w is set as 2.88% based on the historical data.

It is clear that in the absence of the proposed project, all the HFC23 generated from HCFC22 plants of 3F Zhonghao will be vented to the atmosphere. This is the baseline situation. However, if the project can be implemented, almost all the generated HFC23 (99.999%) can be decomposed. The GHGs generated from the project is rather small in quantity. Therefore, compared to the baseline situation, only small amount of GHGs are finally released to the atmosphere, thereby achieving significant GHGs emission reduction and contributing to the mitigation of Climate Change problem.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The system boundary defined in this project activity includes thermal oxidizer, quench, absorption tower, neutralization tower and exhaust stack, while HCFC22 production facility and storage equipment for HF recycle are out of the project boundary.

Figure6. Project Boundary



**B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:**

The baseline study is completed on October 19, 2005

Contact information:

Ms. Fan Yue

Foreign Economic Cooperation Center of Environmental Protection, China

No.277, Zhaodengyu Road, Xicheng District, Beijing, 100034

Tel: 86-10-6653-2352

Email: fan.yue@sepaefeco.org.cn

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:**

01/10/2006

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

21 years

C.2 Choice of the crediting period and related information:**C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

01/10/2006

C.2.1.2. Length of the first crediting period:

7 years and 0 month

C.2.2. Fixed crediting period:

This section is not applicable to the proposed project

C.2.2.1. Starting date:**C.2.2.2. Length:**

**SECTION D. Application of a monitoring methodology and plan****D.1. Name and reference of approved monitoring methodology applied to the project activity:**

The monitoring methodology employed for the decomposition of HFC23 waste at Changshu Zhonghao's HCFC22 production facility is the Approved Monitoring Methodology AM0001/Version 03 ("Incineration of HFC23 waste stream").

The methodology is available on the UNFCCC website:

<http://cdm.unfccc.int/methodologies/PAMethodologies/approved.html>

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

AM0001/Version 03 is applicable to CDM projects that can satisfy the following conditions :

- a) The project occurs at an existing HCFC22 production facility;
- b) The HCFC22 production facility has at least three years of operating history between the beginning of 2000 and the end of 2004; and
- c) No regulation requires the destruction of the total amount of HFC23 in the host country.

The proposed project can meet all the three requirements above:

- a) The proposed project will decompose the HFC23 generated from the existing HCFC22 production facility at 3F Zhonghao.
- b) The HCFC22 production facility at 3F Zhonghao started operations in 2001 and has been in operation for more than three years. The facility has two production lines. The production of HCFC 22 was increased at the plant between 2001 and 2003 in response to increasing demand for HCFC22. As a result, the total annual production was 14,375.963 tons in 2002, 19,974.024 tons in 2003 and 30,979 tons in 2004.
- c) There is no regulation in China restricting HFC23 emissions at this moment or in the near future.

Therefore, AM0001/Version 03 monitoring methodology is fully applicable to the proposed project.

In this project, HFC23 shall be decomposed and the power, steam, and fuel to be consumed by the thermal oxidizer will be measured directly and continuously. Since the quantity of HFC23 fed to the thermal oxidizer is crucial to the total emission reduction generated from the project activity, two flow meters will be installed for the project at 3F Zhonghao in order to ensure the accuracy and conservativeness of the HFC23 measured. Each flow meter will be recalibrated weekly. Most of the time, both flow meters measure the same amount of HFC23 flows simultaneously. When one flow meter is being recalibrated, the other will keep measuring. If HFC23 quantities measured by the two flow meters are different and the difference is smaller than the two times of the flow meter precision value, then the lower HFC23 quantity will be adopted. However, if the difference is larger than the two times of the flow meter precision value, we will immediately assign monitoring staff to identify the problem and resolve the problem.

During the thermal oxidation process of the project, N₂O is also generated, which is also a representative GHG with GWP value of 310 (refer to IPCC Second Assessment Report). However, the quantity of N₂O is very small and thus can be neglected during emission reduction estimation.



Additionally, HCFC22 is a type of GHG with GWP of 1700 (refer to IPCC Second Assessment Report). Since the project activity does not cause any changes to the existing HCFC22 plant, there is no leakage effect associated with HCFC22 emission within the project boundary.

During the HFC23 thermal destruction process, hydrofluoric acid (HF) with the concentration of 30% - 40% is produced. These HF by-products will be stored in barrels. During the life time of the project, HF by-product will be transported and sold to another company. The annual CO₂ emission due to the transport of HF is around 0.3 tCO₂e. This amount is very small and therefore estimated to be negligible.

The monitoring plan for the proposed project also includes the following process for quality control:

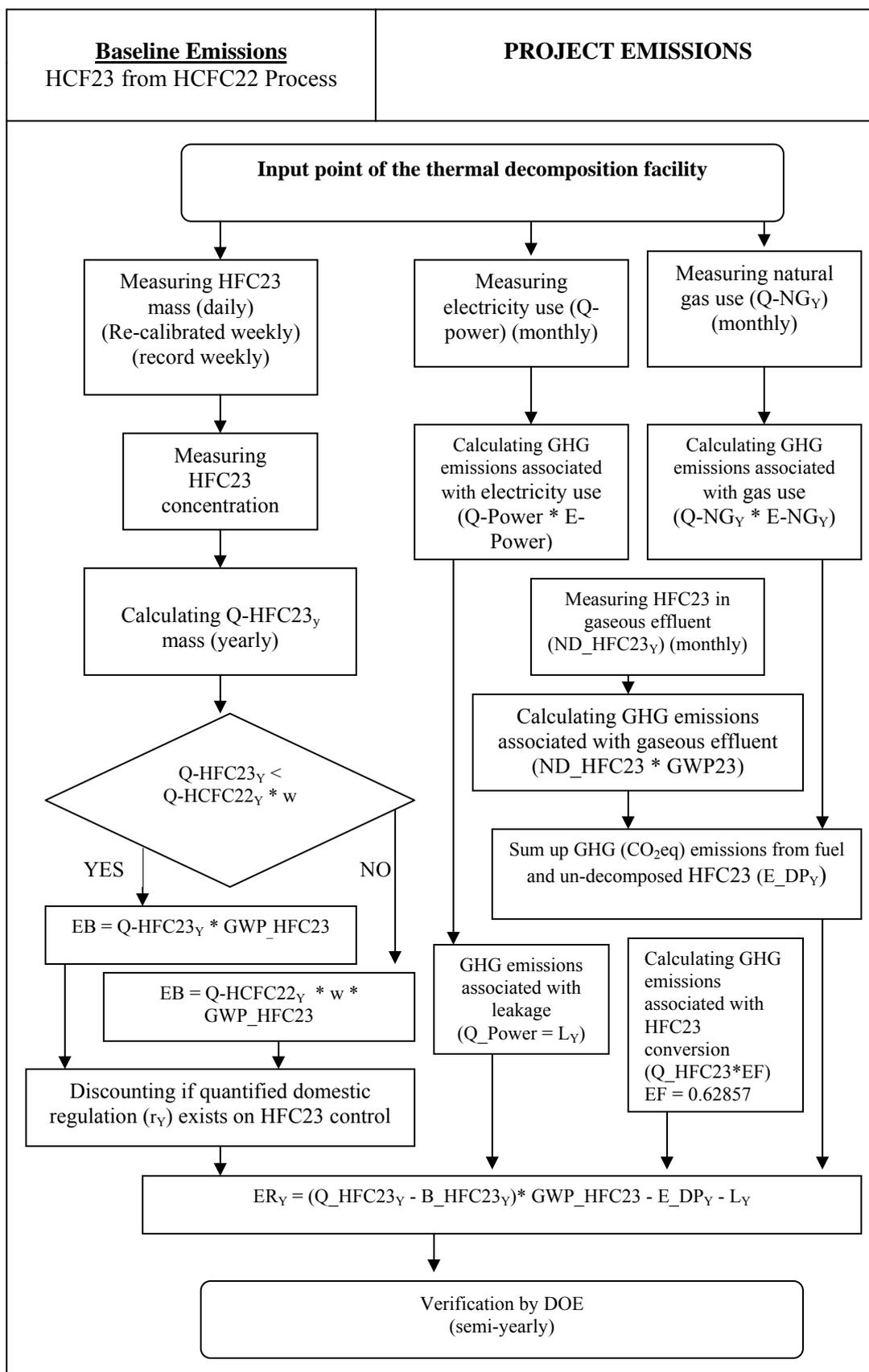
- Purity of HFC23: It will be checked monthly by sampling and using gas chromatography. This value will be combined with the flow meter value (measuring the quantity of HFC23) to determine the actual quantity of HFC23 fed to the thermal oxidizer.
- Amount of HFC23 waste generated: The output of HFC23 from the HCFC22 plant will be checked at least yearly by comparing the amount of HCFC22 manufactured to the sum of the HFC23 produced (“produced” in lieu of “recovered for sale and HFC23 decomposed”).

3F Zhonghao plans to store HFC23 in containers prior to the operation of incineration facility, as well as the storage of HFC23 during the breakdown of the decomposition facility. The amount of HFC23 stored in the containers will be monitored and recorded separately. These collected data will be available for DOE during verification process. Emission credits are only generated for the HFC23 actually destroyed. Any HFC23 stored but not destroyed will not be counted.

Furthermore, the quantities of gaseous effluents (CO, HCl, HF, dioxin and NO_x) and liquid effluents (PH, COD, BOD, SS, fluoride and metals) are measured every six months to ensure compliance with environmental regulations.



Figure 7. Outline of Monitoring and Evaluation Procedures of Emissions



**D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario****D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
D.2.1.1. -1 q_HFC23 _y	Quantity of HFC23 supplied to the destruction process	Flow meter	ton-HFC	Measured	Monthly	100%	Electronic	Measured by two flow meters in parallel Calibration will be done weekly The amount of stored HFC23 prior to the operation of incineration facility will also be measured by the two flow meters
D.2.1.1. -2 P_HFC23 _y	Purity of HFC23 supplied to the destruction process	chromatography	%	Measured	Monthly		Electronic	Measured by sampling and using gas chromatography
D.2.1.1. -3 Q_HFC23 _y	Estimated quantity of HFC23 supplied to the destruction process	Calculated from q_HFC23 _y and P_HFC23 _y	ton-HFC23	Calculated	Monthly	100%	Electronic	$Q_{HFC23y} = q_{HFC23y} * P_{HFC23}$
D.2.1.1. -4 Q_NG _y	Quantity of NG used in the destruction process	Fuel meter	ton	Measured	Monthly	100%	Electronic	Measured by using a fuel meter
D.2.1.1. -5 E_NG _y	Emission factor of fuel (NG)	Calculated from the molecular weight of NG	tCO ₂ e / t	Measured	Monthly	100%	Electronic	$E_{NGy} = \text{molecular weight of CO}_2(44) * \text{number of C in 1 molecular of NG} / \text{molecular weight of NG}$

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		and CO ₂						
D.2.1.1. -6 q_HFC23 _y storage	Quantity of HFC23 stored in containers	Weight meter	ton	Measured	Monthly	100%	Electronic	The quantity of stored HFC23 for each container will be monitored; Each container will be identified with the number and the date stored

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

$$E_{DP_y} = ND_{HFC23_y} * GWP_{HFC23} + Q_{NG_y} * E_{NG_y} + Q_{HFC23_y} * EF$$

$$= ND_{HFC23_y} * 11700 + Q_{NG_y} * E_{NG_y} + Q_{HFC23_y} * EF$$

$$EF=0.62857$$

D.2.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
D.2.1.3. -1 Q_HCFC22 _y	The quantity of HCFC-22 produced	Weight meter	ton-HCFC22	Measured	Monthly	100%	Electronic	This value will be checked against the restriction conditions (cut-off rate, w) The amount of HCFC22 will also be monitored since the start of the HFC23 storage activity prior to the operation of the incineration facility
D.2.1.3 -2 HFC23 _y _{sol} d	The quantity of HFC23 sold	Weight meter	ton HFC23	Measured	Monthly	100%	Electronic	This value is zero, as no HFC23 is sold by the company. However, the impact of this indicator will be considered during the life span of the project



D.2.1.3 -3 r _y	Local regulation on HFC23 emission control	Governmental laws and regulations	ton HFC23	Estimated	Monthly	100%	Electronic	Estimated in consideration of governmental laws and regulations on HFC23 control
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D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

$$B_{\text{HFC23}_y} = Q_{\text{HFC23}_y} * r_y$$

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

This section is not applicable to the proposed project.

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.):

**D.2.3. Treatment of leakage in the monitoring plan****D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity**

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
D.2.3.1. -1 ND_HFC23 _y	Quantity of HFC23 in gaseous effluent	chromatography	ton-HFC23	Measured	Monthly	100%	Electronic	When the thermal oxidizer stops, analysis of the effluent gas is done to check leaked HFC23 by sampling
D.2.3.1. -2 Q_Power _y	Electricity consumption by the destruction process	Electricity meter	kWh	Measured	Monthly	100%	Electronic	Metered
D.2.3.1. -3 E_Power	Emission factor of power	Calculated from data of East China Grid	tCO ₂ e/kWh	Calculated	Annually	100%	Electronic	E _{power} = coal consumption * heating value of coal * CO ₂ emission factor (IPCC value)
D.2.3.1.-4 Q_Steam	Consumption of Steam	Steam meter	ton	Measured	Monthly	100%	Electronic	Metered

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

$$L_y = Q_Power_y * E_Power_y + ET_y$$

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

$$ER_y = (Q_HFC23_y - B_HFC23_y) * GWP_HFC23 - E_DP_y - L_y$$

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**D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored**

Data (Indicate table and ID number e.g. 3.-1.; 3.2.)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Q_HFC23 _y	Low	The output of HFC23 from the HCFC22 plant will be checked yearly by comparing the amount of HCFC22 manufactured to the sum of the HFC23 produced
ND_HFC23 _y	Low	Will be measured from the gas effluent of the destruction process
P_HFC23 _y	Low	Will be measured using gas chromatography
Q_NG _y	Low	Will be metered using NG meter
Q_Power _y	Low	Will be metered using electricity meter
Q_HCFC22 _y	Low	Will be obtained from production records of HCFC22 production line A and line B
HFC23 sold	Low	Will be obtained from production records of HCFC22 production line A and line B
q_HFC23_storage	Low	Will be monitored by using weight meter

All the measurement equipment will be recalibrated according to international rules and standards for measurement. Flow meters will be recalibrated weekly in order to reduce measurement error.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

3F Zhonghao has an integrated management system in place. The company has obtained ISO14001 and ISO9001 certifications. Based on its certified environmental management system and quality management system, 3F Zhonghao is committed to make continuous improvement both in business and environmental protection. After the proposed project is implemented, 3F Zhonghao will enlarge its ISO9001 and ISO14001 applicable scope to cover the project activity.

Management structure:

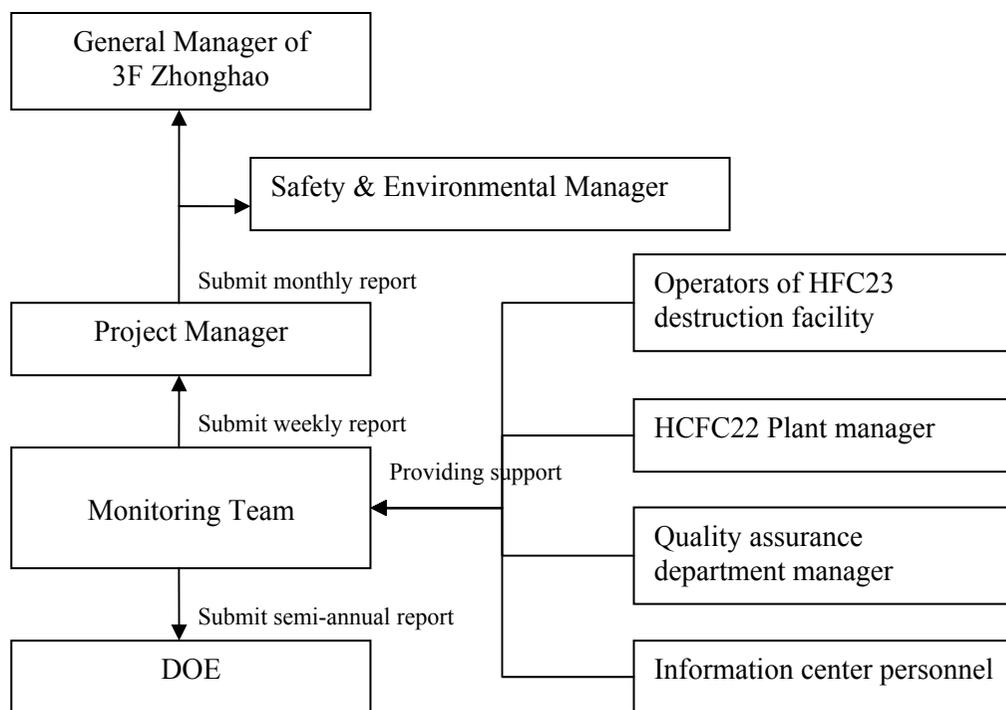
The management structure for the proposed CDM project at 3F Zhonghao is shown in figure 8. A project manager will be designated to be in charge of the overall management and implementation of this proposed project. He is also the head of the monitoring team. The monitoring team consists of professional monitoring personnel who will perform all the monitoring activities according to the monitoring plan described in this project design document. At the same time, the project manager will also be responsible for coordinating relevant departments, such as the operators of HFC23 destruction facility, the HCFC22 plant manager, quality assurance department manager and information center personnel to provide support to the project operation and monitoring. A monthly report will be sent to the general manager and safety & environmental manager of 3F Zhonghao by the project manager. The monitoring team will not only

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submit weekly report to the project manager but also prepare semi-annual report for DOE verification. Before implementation of this project, the personnel relevant with thermal destruction facility operation and monitoring will be trained to acquire comprehensive knowledge with regards to general and technical aspects of this CDM project. The technology supplier will also provide instruction on installation, operation, maintenance and calibration of all the new equipments.

Figure 8. Management structure for the proposed project



Emergency preparedness:

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Emergency preparedness plan is part of 3F Zhonghao's safety and environmental management system. The existing plan has combined inventory of hazardous substances, identification of potential accidents, and steps to respond to the potential accidents. The detailed procedures in the existing emergency preparedness plan will be regularly checked and revised for improvement. Beyond this plan, the technology provider of the proposed project also provided detailed technical solutions for emergency preparedness. In case the thermal destruction facility encounters emergency shut-down, all equipment will immediately switched to a safe mode. Finally, monitoring instruments will be regularly checked. If any faults or problems are identified, they will be immediately fixed or the equipment will be replaced.

D.5 Name of person/entity determining the monitoring methodology:

The monitoring study is completed on October 19, 2005

Contact information:

Ms. Fan Yue

Foreign Economic Cooperation Center of Environmental Protection, China

No.277, Zhaodengyu Road, Xicheng District, Beijing, 100034

Tel: 86-10-6653-2352

Email: fan.yue@sepaefeco.org.cn

**SECTION E. Estimation of GHG emissions by sources****E.1. Estimate of GHG emissions by sources:**

Within the system boundary, GHG emissions include CO₂ release due to conversion of HFC23 in thermal oxidation process, CO₂ equivalent of non-decomposed HFC23 and GHG (CO₂ and N₂O) release from burning of fuel (in this case NG is used as fuel).

$$E_{DP_y} = ND_{HFC23_y} * GWP_{HFC23} + Q_{NG_y} * E_{NG_y} + Q_{HFC23_y} * EF$$

Where :

E_{DP_y} (tCO₂e) is the sum of the emissions in the project boundary during a given year (y).

ND_{HFC23_y} (ton) is the quantity of HFC23 not decomposed in that year.

GWP_{HFC23} is the Global Warming Potential value of HFC23: 11700.

Q_{NG_y} (ton) is the quantity of natural gas consumed by the decomposition process

E_{NG_y} is the emission factor indicating the quantity of CO₂ and N₂O generated when 1 ton of natural gas is used.

Q_{HFC23_y} (ton) is HFC23 decomposed by the project activity in that year.

EF is the emission factor that indicates the quantity of CO₂ generated when 1 ton of HFC23 is decomposed.

E.2. Estimated leakage:

According to AM0001/Version 03 methodology-version3, the leakage effect is the indirect GHG emissions associated with the consumption of power, steam, and transport of sludge to the landfill. For this project at 3F Zhonghao, the steam used by the thermal oxidation system comes from a sulphuric acid plant near 3F Zhonghao Company. The steam is not additionally generated for the thermal oxidation system but is produced as a by-product of sulphuric acid manufacture without expanding its steam generation¹. Therefore we will not include steam into the leakage estimation formulae.

During the thermal oxidation process of the project, N₂O is also generated, which is also a representative GHG with GWP value of 310 (refer to IPCC Second Assessment Report). However, the quantity of N₂O is very small and thus can be neglected during emission reduction estimation. Besides, HCFC22 is a type of GHG with GWP of 1700 (refer to IPCC Second Assessment Report). Since the project activity does not cause any changes to the existing HCFC22 plant, there is no leakage effect associated with HCFC22 emission in the project.

$$L_y = Q_{Power_y} * E_{Power_y} + Q_{Steam_y} * E_{Steam_y} + ET_y$$

Where :

L_y (tCO₂e) is the sum of the emissions outside the project boundary in the given year (y)

Q_{Power_y} (kWh) is the quantity of power consumed by the thermal oxidation system

E_{Power_y} is the emission factor that indicates CO₂ emissions generated per kwh of power consumed.

Q_{Steam_y} (ton) is the quantity of steam consumed by the thermal oxidation system

E_{Steam_y} is the emission factor that indicates CO₂ emissions generated per ton of steam consumed

¹ The proposed project roughly consumes steam at 109 ton/year. All the consumed steam will come from the sulphuric acid plant which can annually generate steam of 300,000 tons.



ET_y (tCO₂e) is the quantity of green house gas emissions associated with transport of sludge.

The sludge (CaF₂, around 500 tons per year) generated by the project during wastewater treatment will be reused at 3F Zhonghao for HF production. Thus, no CO₂ emissions are generated due to transport of CaF₂ to the landfill.

Besides, in this project, around 2800 tons of HF acid is generated per year as by-product. These HF will be transported and sold to a company via shipping. The company is 2 km away from 3F Zhonghao. The freighter load is 150 ton. The freighter is powered by diesel engine with a fuel efficiency of 900 km/ t-diesel oil. Thus, the total diesel oil consumed is 0.09 ton/year. Accordingly, the annual CO₂ emission due to the transport of HF is around 0.3 tCO₂e. This amount is very small and therefore estimated to be negligible.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

$$EP_y = E_{DP_y} + L_y$$

Where EP_y (tCO₂e) represents the project activity emissions

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

$$B_{HFC23_y} = Q_{HFC23} * r_y$$

Where :

Q_{HFC23_y} (ton) is HFC23 decomposed by the project activity in that year.

B_{HFC23_y} (ton) is the baseline emission of HFC23 regulated by the host country. Since China so far has no regulations on the control of HFC23 emissions, this value is set as zero.

To exclude the possibility of manipulating the production process to increase the quantity of HFC23, Q_{HFC23_y} is limited to a fraction (w) of the actual HCFC22 production during the given year y.

According to the AM0001/Version 03 methodology there are three options for calculating the variable w:

1. "Direct measurement of HFC23 release is to be used where data are available, otherwise
2. Mass balance or other methods based on actual data are to be used. Uncertainty in emission rate estimates shall be quantified and conservative emission rate estimates shall be used when calculating expected emission reductions.
3. If insufficient data is available for calculating HFC23 emissions for all three most recent years up to 2004, then w is set at the default value of 1.5%.

Regardless of which option is followed it is stated that "The value of w is set at the lowest of the three historical annual values estimated as specified above and is not to exceed 3% (0.03 tonnes of HFC 23 produced per tonne of HCFC 22 manufactured)".

In this project a mass balance method (including carbon balance calculation and fluorine balance calculation) based on actual data has been used to calculate the value of w. For the production line A at 3F Zhonghao, the emission rate (HFC23/HCFC22) are 3.62% (2002), 3.72 % (2003), and 3.45 % (2004). For the production line B at 3F Zhonghao, the emission rate (HFC23/HCFC22) are 3.68 % (2002), 3.54% (2003), and 2.88% (2004). These values are the average of the two values obtained by carbon balance calculation and fluorine balance calculation. To be conservative, w obtained for this project is the



lowest value (2.88%), even though all the HFC23 generated from the two HCFC22 production lines at 3F Zhonghao will be sent to the thermal oxidizer for destruction.

Therefore, Q_{HFC23_y} needs to satisfy: $Q_{HFC23_y} \leq Q_{HCFC22_y} * w$ ($w = 2.88\%$).

Where Q_{HCFC22_y} is the maximum quantity of HCFC22 produced from the existing production facility during the last three years between 2000 and 2004 (The existing production facility includes two existing production lines but excludes a production line that started its operation in December 2004 in accordance with the methodology AM0001/Version 03. Since the annual production of HCFC22 at 3F Zhonghao in 2002, 2003 and 2004 are 14,375.963 tons, 19,974.024 tons and 30,979 tons respectively, the value of Q_{HCFC22} for this project is 30,979 tons per year.

To ensure conservativeness, even when the quantity of HFC23 generated by the project activity is more than $Q_{HCFC22_y} * w$, the accepted quantity of HFC23 remains equal to the calculation result of $Q_{HCFC22_y} * w$.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

$$ER_y = (Q_{HFC23_y} - B_{HFC23_y}) * GWP_{HFC23} - E_{DP_y} - L_y$$

Where ER_y is the total emission reduction of the project activity in the given year y , measured in tons of CO_2 equivalent.

E.6. Table providing values obtained when applying formulae above:

Table 1. Estimation of Emission Reductions

Year	Estimation of Project activity Emission reductions (tonnes of CO ₂ e)	Estimation of baseline emission reductions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of Emission reductions (tonnes of CO ₂ e)
Year 2006	2,690,400	0	88	2,609,312
Year 2007	10,437,602	0	353	10,437,249
Year 2008	10,437,602	0	353	10,437,249
Year 2009	10,437,602	0	353	10,437,249
Year 2010	10,437,602	0	353	10,437,249
Year 2011	10,437,602	0	353	10,437,249
Year 2012	10,437,602	0	353	10,437,249
Year 2013	10,437,602	0	353	10,437,249
Year 2014	10,437,602	0	353	10,437,249
Year	10,437,602	0	353	10,437,249



2015				
Year 2016	10,437,602	0	353	10,437,249
Year 2017	10,437,602	0	353	10,437,249
Year 2018	10,437,602	0	353	10,437,249
Year 2019	10,437,602	0	353	10,437,249
Year 2020	10,437,602	0	353	10,437,249
Year 2021	10,437,602	0	353	10,437,249
Year 2022	10,437,602	0	353	10,437,249
Year 2023	10,437,602	0	353	10,437,249
Year 2024	10,437,602	0	353	10,437,249
Year 2025	10,437,602	0	353	10,437,249
Year 2026	10,437,602	0	353	10,437,249
Year 2027	7,828,202	0	265	7,827,937
Total (t CO₂e)	219,189,642	0	7413	219,182,229

Table 2. Data for Project Emission Reduction Calculation

Indicator	Unit	Value
Q _{HCFC22_v}	ton HCFC22	30979
w	ton HFC23 / ton HCFC22	2.88%
Q _{HFC23_v}	ton HFC23	892.19
B _{HFC23_v}	ton HFC23	0
GWP _{HFC23}	tCO ₂ e/ tonHFC23	11700
ND _{HFC23_v}	ton HFC23	30979*2.88%*0.001%
EF	tonCO ₂ / tonHFC23	0.62857
Q _{NG_v}	ton NG	129.4
E _{NG_v}	tonCO ₂ /ton NG	2.75
Q _{Power_v}	kwh	346169.7
E _{Power_v}	tCO ₂ e/kwh	1.02 *10 ⁻³
EB	tCO ₂ e	10438623
E _{DP_v}	tCO ₂ e	1021
L _v	tCO ₂ e	353
ER _v	tCO ₂ e	10437249



[Note: Some figures are the estimated values and to be replaced by the monitored values after implementation of the project.]

Identification of Q_HFC23_y

$$Q_HFC23y = Q_HCFC22y * w = 30979 * 2.88\% = 892.19 \text{ ton}$$

Identification of ND_HFC23_y

The HFC23 destruction efficiency of the proposed technology is 99.999%.

$$\text{So } ND_HFC23y = 30979 * 2.88\% * 0.001\%$$

Identification of EF

$$EF = 44 / [(\text{molecular weight of HFC23}) / (\text{number of Carbon atoms in one molecular of HFC23})] = 0.62857$$

Identification of E_NG_y

$$E_NGy = 44 / \text{molecular weight of } CH_4 = 44/16 = 2.75 \text{ tonCO}_2 / \text{ton NG}$$

Identification of E_Power

The electricity required for this project will be supplied by East China Grid which covers four provinces and one municipality (Shanghai municipality, Jiangsu province, Zhejiang province, Anhui province and Fujian province). The coal consumption data of East China Grid is listed in Table 3.

Table 3. Coal Consumption of East China Grid

East China Grid	Power generation (million kWh)	Coal Consumption (g/kWh)
Shanghai	69444	349
Jiangsu	133677	370
Zhejiang	109220	345
Anhui	55715	340
Fujian	61071	354
Weighted average		354.1

(Source: Yearbook of China Power, 2004)

Heating value of coal: 29.3MJ/kg (IPCC default value²)

CO₂ emission factor: 0.0983 kgCO₂/MJ (IPCC default value)

So, E_Power = coal consumption per kWh of power generation * heating value of coal * CO₂ emission factor

$$= 354.1 * 10^{-3} * 29.3 * 0.0983$$

$$= 1.02 \text{ kgCO}_2 \text{e/kWh}$$

$$= 1.02 * 10^{-3} \text{ tCO}_2 \text{e/kWh}$$

² The official domestic data is not available, so IPCC value is applied here.

**The total emission reduction in a regular year is expected to be :**

$$\begin{aligned}
 \text{ER}_y &= \text{EB} - \text{E_DP}_y - \text{L}_y \\
 &= (\text{Q_HFC23}_y - \text{B_HFC23}_y) * \text{GWP_HFC23} - (\text{ND_HFC23}_y * \text{GWP_HFC23} + \text{Q_HFC23}_y * \text{EF} + \\
 &\quad \text{Q_NG}_y^3 * \text{E_NG}_y) - \text{Q_Power}_y^4 * \text{E_Power}_y \\
 &= 892.19 * 11700 - (892.19 * 0.001\% * 11700 + 892.19 * 0.62857 + 892.19 * 0.145 * 2.75) - 892.19 \\
 &\quad * 388 * 1.02 * 10^{-3} \\
 &= 10438623 - 1021 - 353 \\
 &= \mathbf{10437249} \text{ tCO}_2\text{e}
 \end{aligned}$$

SECTION F. Environmental impacts**F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

As required by “Environmental Impact Assessment Law of China” and “Ordinance of Environmental Management for Construction Projects”, the proposed project shall go through an Environmental Impact Assessment (EIA) and the project entity shall submit an EIA Report to local Environmental Protection Bureau for approval. 3F Zhonghao already performed an EIA according to the law and ordinance above. Moreover, an EIA report for the proposed project has been approved by Changshu Environmental Protection Bureau. The EIA report includes the following items:

- Overview of the construction project;
- Status quo of the surrounding environment of the construction project;
- Analysis, forecast and assessment of the potential environmental impact of the construction project;
- Measures taken by the construction project for environmental protection as well as technical and economic demonstrations;
- Analysis of economic gains and loss of the construction project’s environmental impact;
- Recommendations for implementing environmental monitoring of the construction projects;
- Conclusion of the environmental impact assessment

In the conclusion section of the EIA report, it shows that the proposed project is in accordance with local overall planning and with great contribution to the social and economic development of the local area. The main contribution of this project is to mitigate climate change problem through reducing HFC23, which is one kind of greenhouse gas with high GWP. Although this project involves construction and combustion that will have some adverse impacts on the environment, the project entity has decided to adopt some measures to eliminate the impacts. Therefore, the project is fully acceptable from an environmental perspective. All the wastes generated from the project will be appropriately treated and will comply with national environmental regulations and standards.

A summary of the key findings of the EIA report follows. The full EIA report is available for review by the Validator on request.

Gaseous effluents:

³ The proposed project consumes 0.145ton NG when decomposing 1 ton of HFC23

⁴ The proposed project consumes 388kWh electricity when decomposing 1 ton of HFC23



Incineration of HFC23 and HCFC22 generates hydrogen fluoride (HF) and hydrogen chloride (HCl). Therefore, the combustion gas from the thermal oxidizer (furnace) is scrubbed with water and caustic soda to completely remove such acid substances before being vented to the atmosphere. Sample gas is periodically taken for analysis at the vent stack to ensure that the level of harmful substances meets the relevant national standard (Pollution Control Standard for Hazardous Wastes Incineration, GB18484-2001).

The expected exhaust conditions of the destruction system and the gaseous emission standards of China are shown in Table 4.

Table 4. Gaseous effluents from the project

No.	Pollutants	Exhaust gas conditions of the destruction system (Provided by the technology provider, VICHEM)	GB18484-2001
1	HF	<1 mg/m ³	≤9.0 mg/m ³
2	HCl	<10 mg/m ³	≤100 mg/m ³
3	CO	<50 mg/m ³	≤100 mg/m ³
4	NO _x	<200 mg/m ³	≤500 mg/m ³
6	Dioxin	<0.1 TEQng/m ³	≤0.5 TEQng/m ³

From Table 4, we can see that the gaseous emission levels of the destruction system are much lower than the emission levels required by China's environmental standard on air pollution control (Pollution Control Standard for Hazardous Wastes Incineration, GB18484-2001). So the proposed project fully complies with local regulations for gaseous emission control.

Noise:

In this project, noise mainly comes from the air blowers of the thermal oxidizer, induced draft fan for waste gas treatment and various kinds of water pumps. In order to weaken the noise, the project will apply equipment with low noise level and adopt some measures such as sound insulation and vibration absorption in the plant. The noise and its control are summarized in Table 5.

Table 5. The main sources of noise and noise control measures

No.	Main source of noise	No. of equipments	Noise level dB (A)	Control measures	dB (A) after noise control
1	Air blowers of the thermal oxidizer	2	95	Vibration damping, sound insulation, installation of sound eliminator	≤55
2	Induced draft fan for waste gas treatment	1	90	Sound insulation, vibration damping, installation of sound eliminator	≤55



3	Various kinds of water pump	4	80	Vibration damping, sound insulation	≤55
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The noise level of the project can be fully in compliance with the relevant national standard (National Standard of Noise at the Boundary of Industrial Enterprises, GB12348-90).

Liquid effluent :

The waste water generated from the project only contains small amount of NaF and NaCl. It will be treated with CaCl₂ at the on-site waste water treatment facility of 3F Zhonghao. After treatment, the liquid effluent to be discharged can be fully in compliance with China's National Integrated Wastewater Discharge Standard (GB8978-1996). The PH, SS, COD and the Fluoride content of the wastewater are listed in Table 6.

Table 6. Waste water discharges from the project

Indicator	Value	GB8978-1996
PH	6-9	6-9
Fluoride	≤10mg/L	≤10mg/L
SS	≤70mg/L	≤70mg/L
COD	≤100mg/l	≤100mg/l

F.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:

According to environmental impact assessment report, the environmental impact of the proposed project is low.

SECTION G. Stakeholders' comments

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

The implementation of the project will have some impacts on local economy, society and environment. It is important to design and implement the project in consultation with local stakeholders to make sure the project will have positive impacts on them.

According to Environmental Impact Assessment Law of China, for construction project for which an EIA report is required, the project entity shall hold public consultation meetings or adopt other forms of soliciting the opinions of relevant stakeholders. For this proposed project, 3F Zhonghao has carried out stakeholder consultation process in accordance with EIA law of China. In order to undertake a more sufficient consultation process, both public consultation meeting and questionnaire-based survey have been adopted.

1. Public consultation meeting :



3F Zhonghao organized two meetings for public comments on the proposed project. The first meeting was held on September 2, 2005 and the other was held on September 26, 2005. 3F Zhonghao invited local stakeholders including nearby residents, local governmental officials, leading members of NGOs, and representatives from nearby enterprises, school and hospital to attend the two meetings. During the first meeting, 3F Zhonghao gave an introduction about the ongoing CDM project to the participants and asked for their opinions on it. After stakeholders' comments were collected, 3F Zhonghao found that the key concern of stakeholders is the environmental impacts of the project. Therefore, 3F Zhonghao invited environmental experts to perform an Environmental Impact Assessment (EIA) for this CDM project. In the second meeting, 3F Zhonghao introduced the progress of the project and provided EIA report to the stakeholders. Most concerns of the stakeholders (such as information on the general situation of the project, the engineering work, the emission level of wastes and the countermeasures to be taken) have been clearly addressed and explained in the EIA report. Besides having answered questions of the stakeholders and providing them with updated project information, 3F Zhonghao solicited further comments from the stakeholders during the second meeting.

Meeting records with the signature and stamps of all the participants have been archived.

2. Questionnaire-based survey:

3F Zhonghao spread 60 questionnaires and got all of them back. They are all valid and reliable.



Table 7. Questionnaire Sample

Information of interviewee	Name		Gender	
	Occupation		Age	
	Education		Nationality	
	Address			
	Work place			
	How many years have you lived in this area?	<input type="checkbox"/> Within 10 years ; <input type="checkbox"/> 10 - 20 years ; <input type="checkbox"/> 20-30 years ; <input type="checkbox"/> Over 30 years		
	How far is your location away from 3F Zhonghao	<input type="checkbox"/> Within 500m ; <input type="checkbox"/> 500 -1000m ; <input type="checkbox"/> 1000-2000m ; <input type="checkbox"/> Further than 2000m		
The attitude of Interviewee on the project	1. Are you satisfied with the present local environment?		<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied <input type="checkbox"/> Unclear	
	2. Do you think it is important to carry out this CDM project?		<input type="checkbox"/> Very important <input type="checkbox"/> Important <input type="checkbox"/> Not important <input type="checkbox"/> No idea	
	3. Do you agree to carry out this CDM project?		<input type="checkbox"/> Agree <input type="checkbox"/> Object <input type="checkbox"/> Do not care	
	4. Do you think the selection of project location reasonable?		<input type="checkbox"/> Reasonable <input type="checkbox"/> Not reasonable <input type="checkbox"/> Do not care	
	5. Which problem do you think is the main environmental problem caused by this project?		<input type="checkbox"/> Air pollution <input type="checkbox"/> Water pollution <input type="checkbox"/> Noise	
	6. In your mind, what impact does this project have on the ecosystem?		<input type="checkbox"/> Positive impact <input type="checkbox"/> Negative impact <input type="checkbox"/> No impact	
	7. What impact does this project have on local environment?		<input type="checkbox"/> Positive Impact <input type="checkbox"/> Negative Impact <input type="checkbox"/> No impact	
	8. Are you satisfied with the countermeasures adopted to mitigate adverse environmental impacts?		<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied <input type="checkbox"/> Not sure <input type="checkbox"/> Not familiar with the countermeasures	
	9. What impact does this project have on local economy ?		<input type="checkbox"/> Positive Impact <input type="checkbox"/> Negative impact <input type="checkbox"/> No impact	
Comments and suggestions	Do you have any comments on this project?			
	Do you have any suggestions on this project? (please mention the measures you wish us to take during project development)			



Table 8. General information of interviewee

Indicator	Category	Number	Percentage (%)
Age	Below 18 years old	4	6.7
	18—35 years old	24	40
	36—55 years old	26	43.3
	Over 55 years old	6	10
Occupation	Worker	26	43.3
	Engineer	11	18.3
	Teacher /student	6	10
	Farmer	5	8.4
	Other	12	20
Gender	Male	34	56.7
	Female	26	43.3
Education	Middle school uncompleted	14	23.3
	Middle school	34	56.7
	Bachelor or above	12	20

G.2. Summary of the comments received:

Through the two public consultation meetings, local stakeholders were well informed on the CDM project developed by 3F Zhonghao. All the stakeholders expressed that they were glad to know the proposed project would contribute to mitigating global warming and improving local economy driven by the development of 3F Zhonghao company. The stakeholders also showed their full support to the project. Besides, we found that the main concerns of local stakeholders were the potential impacts of the project on local environment and local employment market.

The public opinions collected through questionnaire investigation were summarized in Table 9

Table 9. Questionnaire investigation result

No	Question	Opinion	No. of interviewee	Percentage (%)
1	Are you satisfied with the present local environment?	Satisfied	60	100
		Unsatisfied	0	0
2	Do you think it is important to carry out this CDM project?	Very important	35	58.3
		Important	25	41.7
		Not important	0	0
		Do not know	0	0



3	Do you agree to carry out this CDM project? ?	Agree	60	100
		Object	0	0
		Do not care	0	0
4	Do you think the selection of project location is reasonable?	Reasonable	60	100
		Not reasonable	0	0
		Do not care	0	0
5	Which problem do you think is the main environmental problem caused by this project?	Air pollution	0	0
		Water pollution	0	0
		Noise pollution	0	0
6	In your mind, what impact does this project have on the ecosystem?	Positive impact	56	93.3
		Negative impact	0	0
		No impact	4	6.7
7	What impact does this project have on local environment?	Positive impact	58	96.7
		Negative impact	0	0
		No impact	2	3.3
8	Are you satisfied with the countermeasures adopted to mitigate adverse environmental impacts?	Satisfied	60	100
		Not satisfied	0	0
		Not sure	0	0
		Not familiar with the countermeasures	0	0
9	What impact dose this project have on local economy?	Positive impact	57	95
		Negative impact	1	1.7
		No impact	2	3.3

The questionnaire investigation results summarized in Table 10 confirmed that local stakeholders have sufficient support for the proposed CDM project at 3F Zhonghao.

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

After consultation with local stakeholders, 3F Zhonghao seriously addressed public's main concern – the potential impact of the project on local environment. First, 3F Zhonghao provided the project's EIA report to the stakeholders, frankly and truly informing them how the project will affect the local air quality, surface water, groundwater, soil, surrounding noise level etc. Then 3F Zhonghao exchanged ideas with the local stakeholders on design and selection of countermeasures to mitigate adverse environmental impacts. A series of public consultations made the local stakeholders satisfied with the environmental



impact assessment result of the project. 3F Zhonghao also promised to the local stakeholders that the company will strictly and seriously apply all the countermeasures identified in the EIA report. Regarding the potential impact of the project on local employment market that was raised by stakeholders during public consultation meetings, 3F Zhonghao responded that the company prefers to employ local residents to help local governments solve unemployment problems. Besides, the salary of new employees will be the same as that of the current employees in 3F Zhonghao, so that the local employment market will not be disturbed.

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Changshu 3F Zhonghao New Chemical Materials Co. Ltd.
Street/P.O.Box:	
Building:	
City:	Changshu
State/Region:	Jiangsu Province
Postfix/ZIP:	215522
Country:	People's Republic of China
Telephone:	(86) 512-52322006
FAX:	(86) 512-52627758
E-Mail:	caihui@3f-cs.com
URL:	www.3f-cs.com
Represented by:	
Title:	Vice president
Salutation:	Mr.
Last Name:	Shen
Middle Name:	
First Name:	Xuezhong
Department:	
Mobile:	(86) 13901572765
Direct FAX:	(86) 512-52322175
Direct tel:	(86) 512-52321917
Personal E-Mail:	

Organization:	DNA of Italy (The Ministry for Environment and Territory of Italy)
Street/P.O.Box:	Via, Cristoforo Colombo, 44
Building:	
City:	Rome
State/Region:	
Postfix/ZIP:	00147
Country:	Italy
Telephone:	(+39) 06 5722 8100
FAX:	(+39) 06 5722 8178
E-Mail:	
URL:	www.minambiente.it
Represented by:	James Warren Evans
Title:	
Salutation:	Ms.
Last Name:	Claudia
Middle Name:	
First Name:	Croce
Department:	
Mobile:	
Direct FAX:	(+39) 06 5722 8178



Direct tel:	(+39) 06 5722 8169
Personal E-Mail:	croce.claudia@minambiente.it

Organization:	DNA of the Netherlands (VROM)
Street/P.O.Box:	Rijnstraat 8 30945
Building:	
City:	The Hague
State/Region:	
Postfix/ZIP:	2500 GX
Country:	The Netherlands
Telephone:	+310703393456
FAX:	+310703391306
E-Mail:	Ferry.vanhagen@minvrom.nl
URL:	
Represented by:	
Title:	Director for International Environmental Affairs
Salutation:	
Last Name:	De Boer
Middle Name:	
First Name:	Yvo
Department:	International Environmental Affairs
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	Ferry.vanhagen@minvrom.nl

Organization:	International Bank for Reconstruction and Development
Street/P.O.Box:	1818 H Street NW
Building:	
City:	Washington
State/Region:	DC
Postfix/ZIP:	20433
Country:	USA
Telephone:	1-202-473-2928
FAX:	1-202-522-7432
E-Mail:	wevans@worldbank.org
URL:	www.carbonfinance.org
Represented by:	James Warren Evans
Title:	Director
Salutation:	Mr.
Last Name:	Evans
Middle Name:	James
First Name:	Warren
Department:	Carbon Finance Business
Mobile:	
Direct FAX:	1-202-522-7432



Direct tel:	1-202-473-2928
Personal E-Mail:	wevans@worldbank.org



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Official Development Assistance (ODA) Fund is used in this project.

The sovereign participants of the First Tranche of the UCF confirm that any public funding used to participate in the First Tranche of the Umbrella Carbon Facility does not result in a diversion of official development assistance and is separate from and is not counted towards its financial obligations as a Party included in Annex I.

Annex 3**BASELINE INFORMATION**

Indicator	Definition	Value	Data source
Q_HFC23 _y	Quantity of HFC23 destroyed during year y		Calculated from q_HFC23 _y and P_HFC23 _y
q_HFC23 _y	Quantity of HFC23 waste fed to the destruction process		Monitored by flow meters
P_HFC23 _y	Purity of HFC23 fed to the destruction process		Measured by gas chromatograph
B_HFC23 _y	Baseline quantity of HFC23 destroyed	0	Calculated by the applicable regulations
Q_HCFC22 _y	Maximum historical HCFC22 production at 3F Zhonghao between 2000 and 2004	30979	Provided by 3F Zhonghao
w	HFC23 generation rate at 3F Zhonghao	2.88% (ton HFC23 / ton HCFC22)	Provided by 3F Zhonghao
GWP_HFC23	Global Warming Potential value of HFC23	11700 (tCO ₂ e/ tonHFC23)	IPCC default value
EF	Emission factor of HFC23	0.62857 (tonCO ₂ / tonHFC23)	AM0001/Version 03
E_NG _y	CO ₂ emission factor of fuel consumed by the project	2.75 (tonCO ₂ /ton NG)	Provided by 3F Zhonghao
E_Power _y	CO ₂ emission factor of East China Grid power consumed by the project	1.02*10 ⁻³ (tCO ₂ e/kwh)	Calculated from data of East China Grid and IPCC default value

Please refer to Section E of this project design document for detailed estimation and calculation of the above indicators.



Annex 4

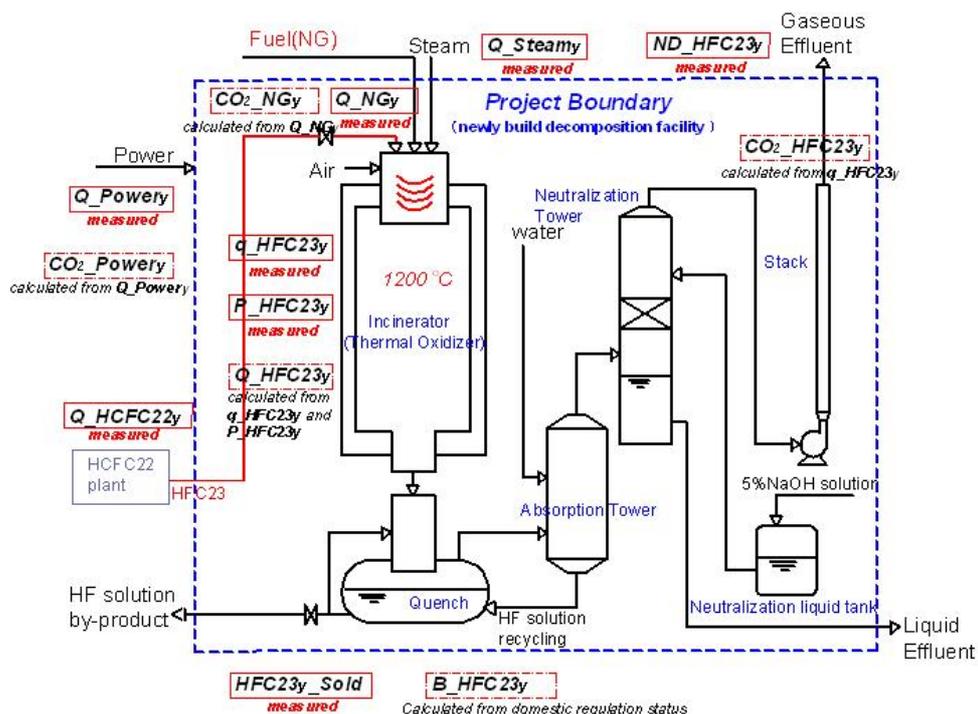
MONITORING PLAN

The monitoring plan (MP) defines a standard against which the project performance in terms of its greenhouse gas (GHG) reductions and conformance with all relevant Clean Development Mechanism criteria will be monitored and verified. It is therefore a tool to help coordinate all the monitoring requirements for generating certified emission reductions from the project.

The information included in this MP will be available at the project site. The implementation of the MP will ensure that the management at 3F Zhonghao can track emission reductions generated by the project.

New employees will also benefit from the existence of an MP since they can quickly be made aware of the importance of keeping emission reduction data. In addition, the MP will be useful in efficiently communicating with the Designated Operational Entity (DOE) during audits and saving valuable time.

Monitoring parameters:



According to AM0001/Version 03 methodology, the following parameters will be monitored.

1. The quantity of HFC23 supplied to the destruction process (q_{HFC23}) will be directly and continuously measured by using two flow meters. In order to have more accurate data, the flow meters will be recalibrated weekly. When one flow meter is recalibrated, the other flow meter will continue measuring the quantity of HFC23 fed to the destruction process.



2. The purity of HFC23 supplied to the destruction process (**p_HFC23**) will be checked monthly by sampling and using gas chromatography.
3. The quantity of HCFC22 produced (**Q_HCFC22**) will be measured by weighing. The amount of HFC23 generated from the HCFC22 plant will be checked yearly against the Q_HCFC22.
4. The electricity consumption (**Q_power**) will be measured by a meter.
5. The fuel consumption (**Q_NG**) will be measured by using a fuel meter.
6. The quantity of leaked HFC23 in gaseous effluent (**ND_HFC23**) will be measured by sampling.
7. The quantities of gaseous effluents (CO, HCl, HF, dioxin and NO_x) will be measured twice a year to ensure that the project is in compliance with the relevant environmental standard in China (GB18484-2001: National Pollution Control Standard for Hazardous Wastes Incineration.).
8. The quantities of liquid effluents (PH, COD, BOD, SS, fluoride and metals) will be measured twice a year and checked against the relevant environmental standard in China (GB8978-1996: National Integrated Wastewater Discharge Standard).

Monitoring structure:

During the project implementation, operators of each shift will record the monitoring data both electronic and paper-based, and the shift heads should check the records to ensure their accuracy. One professional monitoring personnel will be assigned to collect the monitoring data and other supporting data to make a weekly report to the manager of HFC23 decomposition facility. The manager will not only give a report to the General Manager every month, but also prepare the semi-annual monitoring report to DOE for emission reduction verification with the assistance of the monitoring personnel.

Personnel from other departments will support the monitoring work of the HFC23 decomposition. Plant manager of HCFC22 production, quality assurance department manager and information center personnel will provide monitoring personnel information he/she needed, such as data about HCFC22 production, sample analysis results and computer system maintenance.

The personnel relevant with monitoring work will be trained to acquire comprehensive knowledge with regards to general and technical aspects of CDM project. And the monitoring equipments supplier will provide instruction on installation, operation, maintenance and calibration of their equipments.

Furthermore, 3F Zhonghao will enlarge its ISO9001 and ISO14001 applicable scope to cover the proposed project activity within one year after commissioning.