SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

AM0001 "Incineration of HFC 23 Waste Streams" (Version 03).
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:

The approved AM0001 baseline methodology is applicable to:
(1) The HFC 23 waste streams are from an existing HCFC 22 production facility;
(2) At least three years of operating history between beginning of the year 2000 and the end of the year 2004 where the project activity occurs and;
(3) No regulation requires the destruction of the total amount of HFC 23 waste.

This project complies with AM0001, given the following reasons:
(1) This project will decompose the HFC23 generated from JMC's existing two HCFC 22 production lines. HFC23 is an inevitable by-product. Almost all HFC 23 is vented directly to atmosphere;
(2) JMC's two HCFC 22 production lines were put into operation in July and October, 2001. Installation and operation time complies with requirement stipulated in AM0001 (Version 03);
(3) There is no compulsory restriction about HFC 23 production or emission; it is unlikely that any such limits on emissions would be imposed in the near future.

Therefore, the approved AM0001 baseline methodology is applicable to this project.

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 within the project boundary.

A small quantity of N2O emissions are also produced during thermal destruction process while the N2O emissions, on a CO2 equivalent basis, are a small fraction of the CO2e emissions and so are ignored.

The HFC23 stored in the containers prior to incineration system operation and commissioning, and during period of operation suspension of the incineration system due to emergency accidence or overhaul will be monitored, recorded and documented separately for DOE verification, certification purpose. The quantity of the HFC23 stored prior to decomposition and subsequently decomposed would be counted as a part of the project. The emission reductions to be credited are based on the *ex-post* measurement of the quantity of actually decomposed HFC23, i.e. emission credits are only generated for HFC23 actually destroyed so any HFC23 stored but not decomposed will not be counted. Without the destruction facility, the stored HFC 23 could not be destroyed, with future release possible.

During the HFC23 thermal destruction process, hydrofluoric acid (HF) with the concentration of 40% is produced. These HF by-products will be stored in barrels. During the life time of the project, HF by-product may be transported and sold to other companies.

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	monitoring	t-HFC23	m	monthly	100%	electronic	Amount of HFC23 supplied to the destruction process will measured by two flow meters in series but read simultaneously. The amount of HFC23 that is supplied to decomposition process from storage container, rather than from regular HCFC22 production otherwise will be measured by a flow meter installed right after outlet of storage container. The amount of HFC23 generated from HCFC22 production Unit A and Unit B will be measured by two flow meters installed respectively on the two pipelines between Unit A to the buffer and Unit B to the buffer. The flow meters will be calibrated every six months. The zero check will be done weekly.
D 2.1.1-2. P_HFC23_y	Purity of HFC23	Gas chromatography	%	m	monthly	sampling	electronic	Measured using gas chromatography .

	supplied to the destruction process	analysis						
D 2.1.1-3 Q_H $_y$	energy	monitoring	m3	m	monthly	100%	electronic	Meter Measured
D2.1.1-4 TEMP	Temperature of incinerator	thermometer	degree	m	continuously	100%	electronic	To ensure the operation stability of incinerator
D.2.1.1-5 HFC23y_ storage	Quantity of HFC23 stored in container	monitoring	t-HFC23	m	monthly	100%	electronic	The amount of HFC23 stored in container prior to the operation of incineration facility will be measured by a flow meter installed right before access to storage container.

In addition the quantities of gaseous effluents (CO, HCl, HF, Cl_2, dioxin and NO_X) and liquid effluents (PH, COD, BOD, n-H (normal hexane extracts), SS (suspended solid), phenol, and metals (Cu, Zn, Mn and Cr) are measured in a manner and with a frequency that complies with local environmental regulations.

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The project emissions E_DP $_y$ due to decomposition process is calculated as follows:
E_DP $_y$ = ND_HFC23 $_y$ * GWP_HFC23 + Q_H $_y$ * E_H $_y$ + Q_HFC23 $_y$ * EF [1]
The quantity of HFC 23 not destroyed (ND_HFC23y) is typically small; the monitoring plan provides for its periodic on site measurement. E_H $_y$ is the quantity of H_2 used by the destruction process during the year measured in cubic-metres (m3), since H_2 is not GHG, so E_H $_y$, which is the GHG emission coefficient for is 0. The quantity of CO2 produced by the destruction process is the product of the quantity of waste HFC 23 (Q_HFC23 $_y$) destroyed and the emission factor (EF). The emission factor is calculated as follows: EF = 44/[(molecular weight of HFC 23)/(number of C in a molecule of HFC 23)] = 44/[70/1] =0.62857

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number	Data	Source of	Data	Measured	Recording	Proportion	How will the data	Comment

[1] AM0001 specifies this formula as E_DP $_y$ = ND_HFC23 $_y$ * GWP_HFC23 + Q_NG $_y$ * E_NG $_y$ + Q_HFC23 $_y$ * EF

(Please use numbers to ease cross-referencing to table D.3)	variable	data	unit	(m), calculated (c), estimated (e),	frequency	of data to be monitored	be archived? (electronic/ paper)	
D2.1.3-4. Q_HCFC22 y	Mass	The quantity of HCFC 22 produced in the plant generating the HFC 23 waste	t-HCFC22	M	Monthly	100%	electronic	Reference data to check cut off condition and rough estimation of Q_HFC23 y The amount of stored HFC23 prior to the operation of incineration facility will also be measured by the two flow meters The amount of HCFC22 will be also monitored since the start of the HFC23 storing prior to the operation of the incineration facility.
D2.1.3-5. HFC23_sold y	Mass	HFC 23 sold by the facility generating the HFC 23 waste tonnes	t-HFC23	M	annually	100%	electronic	Reference data to check cut off condition and rough estimation of Q_HFC23 y
D2.1.3-6 r y	Amount of HFC23 subject to regulatio n	Governmental authority	t HFC23	C	Yearly	100%	electronic	Estimated in consideration of governmental laws and regulations on HFC23 control

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The baseline quantity of HFC 23 destroyed is the quantity of the HFC 23 waste stream required to be destroyed by the applicable regulations. Thus:
B_HFC23y = Q_HFC23y * ry

Where r_y is the fraction of the waste stream required to be destroyed by the regulations that apply during year y. In China, no such regulation is present or planned to date. In the absence of regulations requiring the destruction of HFC 23 waste, $r_y = 0$. If there is any new regulation on the HFC23 emission, r_y should be modified then.

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

Not applicable

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.):

Not applicable

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
D2.3.1-6. ND_HFC23_y	mass	Quantity of HFC 23 in gaseous effluent	t-HFC23	m	monthly	100%	electronic	When the thermal oxidizer stops, analysis of the effluent gas is done to check leaked HFC 23 by sampling.
D2.3.1-7. Q_Power_y	energy	Electricity consumption during decomposition in year y	kWh	m	monthly	100%	electronic	Meter Measured
D2.3.1-8 Q_Steam_y	energy	Steam consumption during deposition	t-steam	m	monthly	100%	electronic	Meter Measured and calculate
D2.3.1-9 E_Steam_y	energy	greenhouse gas emissions factor for steam during year y	tCO2e/ t-steam	m, c	monthly	100%	electronic	Meter Measured and calculate
D2.3.1-10 E_Power_y	energy	greenhouse gas emissions factor for electricity during year y	tCO2e/ kWh	c	monthly	100%	electronic	Calculated

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Leakage in this project is the CO2 emissions associated with the production of steam and electricity

Ly = ∑i (Q_Fi, y * E_Fi y) + ET $_y$ = Q_ Power y * E_Power $_y$ + Q_Steam $_y$ * E_Steam $_y$ + ET $_y$
Where Q_ Power y is the quantity of electricity purchased for the destruction process during year y, E_Power $_y$ is the greenhouse gas emissions factor of electricity purchased during year y, Q_Steam $_y$ is the quantity of steam purchased for the destruction process during year y, E_Steam $_y$ is the greenhouse gas emissions factor of steam purchased during year y and ET $_y$ is the greenhouse gas emissions associated with sludge transport during year y or as in the case of JMC, dilute HF to nearby markets. Electricity of this project is purchased from China Eastern Electricity Network and steam is purchased from Meilan Thermal Power Plant. Leakage due to transportation of sludge is 0.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The greenhouse gas emission reduction achieved by the project activity is the quantity of waste HFC 23 actually destroyed less the greenhouse gas emissions generated by the destruction process less leakage due to the destruction process. Specifically, the greenhouse gas emission reduction (ERy) achieved by the project activity during a given year (y) is equal to the quantity of HFC 23 waste from HCFC production facility (Q_HFC23y) destroyed by the project activity less the baseline HFC 23 destruction (B_HFC23y) during that year multiplied by the approved Global Warming Potential value for HFC23 (GWP_HFC23) less the greenhouse gas emissions generated by the destruction process (E_DPy) less greenhouse gas leakage (Ly) due to the destruction process.
ERy = (Q_HFC23y - B_HFC23y) * GWP_HFC23 - E_DPy – Ly
Where ERy is the greenhouse gas emission reduction measured in tonnes of CO2 equivalents (tones CO2e), Q_HFC23y is the quantity of waste HFC 23 destroyed during the year measured in metric tonnes, and B_HFC23y is the baseline quantity of HFC 23 destroyed during the year measured in metric tonnes. The Global Warming Potential converts 1 tonne of HFC 23 to tonnes of CO2 equivalents (tonnes CO2e/tonnes HFC 23). The approved Global Warming Potential value for HFC 23 is 11,700 tonnes CO2e/tonne HFC 23. The emissions due to the destruction process (E_DPy) and leakage (Ly) are both measured in tonnes of CO2 equivalent. The quantity of waste HFC 23 destroyed (Q_HFC23y) is calculated as the product of the quantity of waste HFC 23 supplied to the destruction process (q_HFC23y) measured in metric tonnes and the purity of the waste HFC 23 (P_HFC23y) supplied to the destruction process expressed as the fraction of HFC 23 in the waste
Q_HFC23y = q_HFC23y *P_HFC23y

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.
D2.1.1-1 q_HFC23$_y$	Low	Yes. A QA & QC organization will be formed. We plan to measure by two flow meters in series but read simultaneously with semi-annual calibration and weekly zero check.
D2.1.1-2 P_HFC23$_y$	Low	Will be measured by gas chromatography.

D2.1.1-3 Q_H_y	Low	Will be measured by meter.
D2.3.1-6 ND_HFC23_y	Low	Will be measured from the gas effluent of the decomposition process
D2.3.1-9 E_Steam_y	Low	Will be measured by steam meter and calculated
D2.3.1-10 E_Power_y	Low	Will be measured by electricity meter and calculated
D2.3.1-7 Q_Power_y	Low	Will be measured by electricity meter
D2.3.1-8 Q_Steam_y	Low	Will be measured by steam meter
D3-7 Q_HCFC22_y	Low	Will be obtained from production records.
D2.1.1-4 TEMP	Low	Will be measured by thermometer on the exit of the combustion chamber
D.2.1.1-5 HFC23y_ storage	Low	Will be measured by flow meters on access of HFC23 storage container
D2.1.3-5 HFC23_sold	Low	Will be obtained from production records of HCFC22 in JMC

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 JMC in order to ensure the accuracy and conservativeness of the HFC23 measured. The flow meters will be calibrated every six months by an officially accredited entity. The zero check on the flow meters will be conducted every week. 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.

In order to secure the safety of operation, operator staff will be conducted relevant training regarding production process, emergency response, equipment maintenance before starting operation.

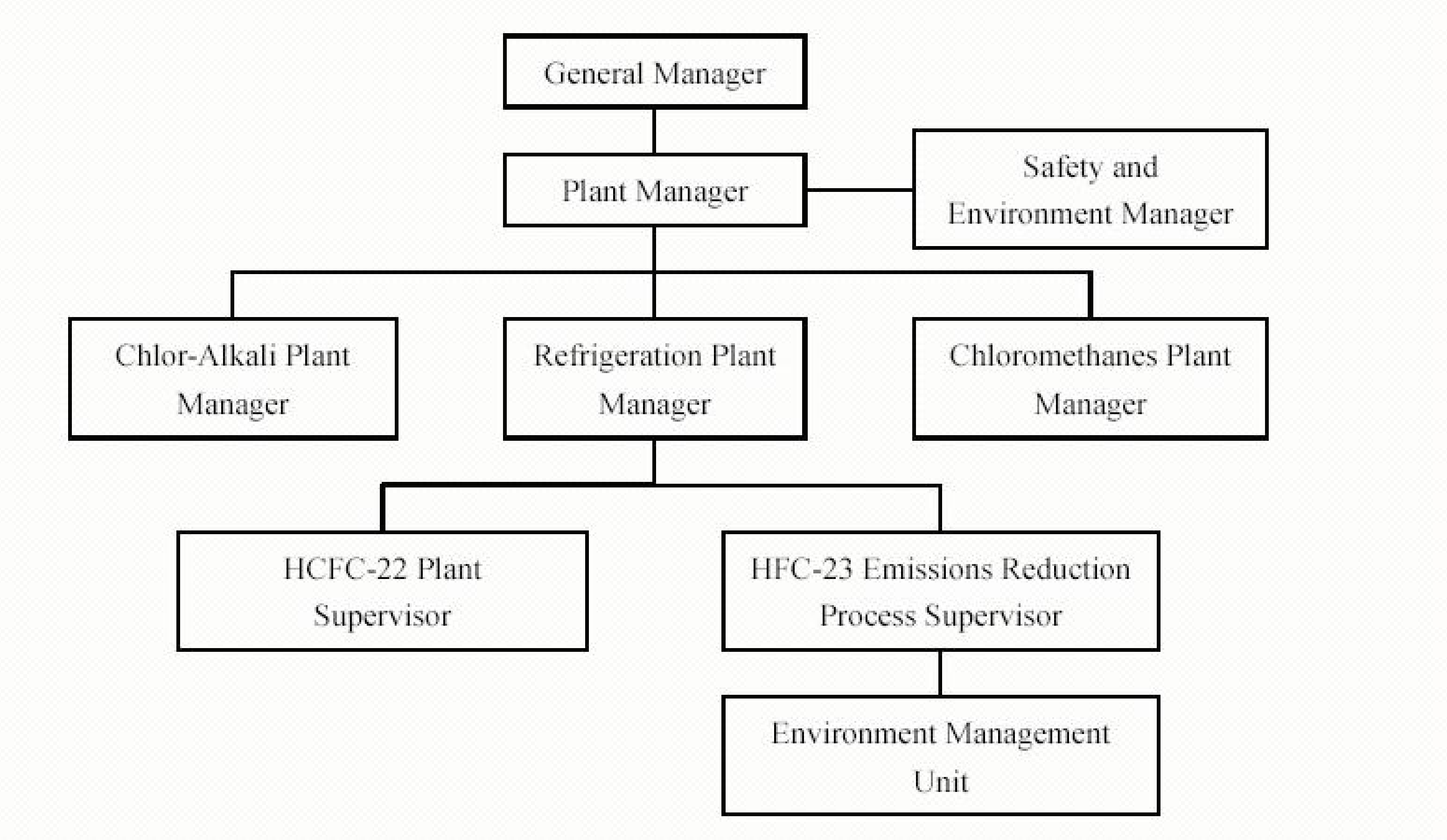
D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

JMC has acquired the certificates of ISO 14001 and ISO 9001 and is following management according to the above both certificates (Certificate No.CNCA-R-2003-112 for ISO 14001 issued in April 2004 and Certificate No.CNAB029-Q for ISO 9001 issued in January 2005). Therefore, the management of operating the project activity, monitoring emission and any leakage shall be in line with ISO standard or the monitoring plan described in project design document.

A project implementation team will be set up to manage and implement this proposed project at the operational level. The team consists of management staff, technical professional and safety and environmental protection staff. The monitoring activities shall be in line with the monitoring plan described in this project design document. Composition of the team is temporarily planned as follows:

Programme Management	2 persons
Gas chromatography analysis	3 persons x 4 shifts = 12 persons
Incinerator and apparatus operation, maintenance	3 persons x 4 shifts = 12 persons
Safety and environmental protection	1 person

At higher management and environment management level, the organizational structure for the HFC-23 Emissions Reduction Project at JMC is shown in Figure 6.



The Environment Management Unit under the HFC-23 Emissions Reduction Process Supervisor will be responsible for planning and carrying out the environmental activities both during the construction and operational phases of the project.

Emergency preparedness:
The HFC-23 Emissions Reduction Process will be operated strictly within the technical parameters of the process to avoid any emergencies. The system design, employee training, and coordination with the relevant institutions (such as the nearest firehouse and hospital) will be key in preventing or counter measuring emergencies. JMC's emergency response plan for the HCFC-22 Plant will include:

Company introduction
Identification, characteristics and impacts of hazardous materials
Safety, firefighting, and personal protection equipment distribution
Emergency response organization staff and responsibilities
Alarm and communication
Inspection of high risk areas and responsibilities
Emergency response for accidents
Personnel evacuation
Levels of emergency response and termination
Training and drills
Emergency response plan management

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

Ms. Zhang Jie
Foreign Economic Cooperation Center of Environmental Protection, China
227, Zhaodengyu Road, Xicheng District, Beijing, 100035

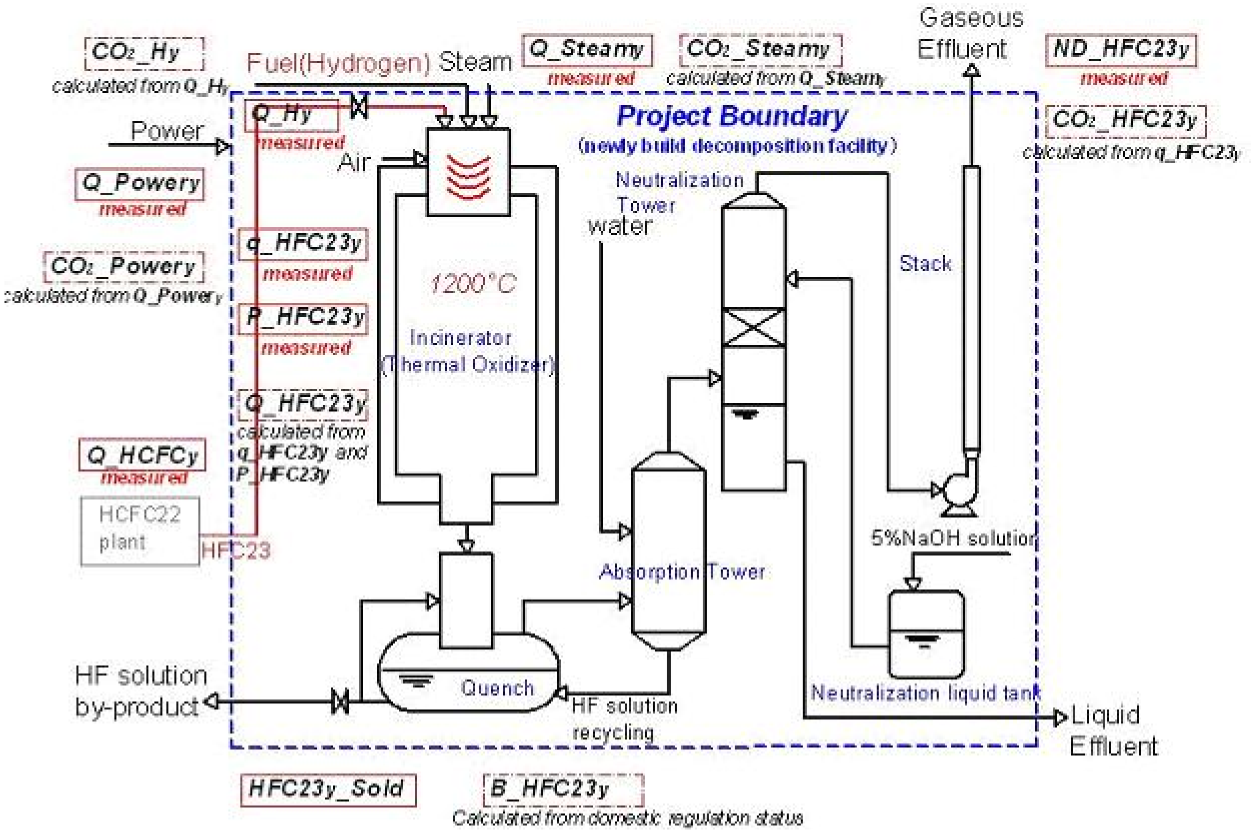
Tel: (+86) 10 5160 0666 ext. 204
Fax: (+86) 10- 8447 6455
Email: zhang.jie@sepafeco.org.cn; gina_zhang@yahoo.com

Mr. Xiao Xuezhi
Foreign Economic Cooperation Center of Environmental Protection, China
227, Zhaodengyu Road, Xicheng District, Beijing, 100035

Tel: (+86) 10 6653 2346
Fax: (+86) 10- 6653 2330
Email: xiao.xuezhi@sepafeco.org.cn
FECO is not project participant

Annex 4

MONITORING PLAN



Following parameters will be monitored:

1. q_HFC23: Quantity of HFC 23 waste stream in gaseous effluent will be measured by two flow meters. To ensure data accuracy, the flow meters will be calibrated every six months by an officially accredited entity and the zero check on the flow meters will be conducted every week.
2. p_HFC23: Purity of the HFC 23 effluent will be analyzed by chromatograph monthly.
3. Q_HCFC22: measure the annual production of HCFC22 and check the rate of HFC23/HCFC22.
4. Q_power: Measured by electricity meter
5. Q_Hy：H2 as power will be measured by meter continuously.
6. ND_HFC23: during the thermal oxidizer operation, analysis of the effluent gas is done to check leaked HFC 23 by sampling.
7. Gaseous effluents: the quantities of gaseous effluents (CO, HCl, HF, dioxin and NOx) will be monitored 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,).Liquid effluents: (PH, COD, BOD, suspended solid, fluoride and metals (Cu, Zn, Mn and Cr)) will be measured twice a year and checked against the relevant environmental standard in China (GB8978-1996: National Integrated Wastewater Discharge Standard).