

**MONITORING REPORT FORM (F-CDM-MR)**  
**Version 02.0****MONITORING REPORT**

<b>Title of the project activity</b>	SF <sub>6</sub> recovery and reclamation project, South Korea
<b>Reference number of the project activity</b>	4274
<b>Version number of the monitoring report</b>	01
<b>Completion date of the monitoring report</b>	27/06/2012
<b>Registration date of the project activity</b>	01/04/2011
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring Period Number : 01 Monitoring Period: 01/04/2011~26/04/2012
<b>Project participant(s)</b>	Solvay Fluor Korea Co. Ltd EcoSecurities International Limited
<b>Host Party(ies)</b>	Republic of Korea
<b>Sectoral scope(s) and applied methodology(ies)</b>	Sectoral Scopes: 11 : Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride Applied methodology: AM0079 version 2, "Recovery of SF <sub>6</sub> from Gas insulated electrical equipment in testing facilities"
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	177,304
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	107,686

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

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**Purpose of the project activity:**

The Project activity aims to reduce emissions of SF<sub>6</sub> from the Korea Electrotechnology Research Institute (KERI) testing facility of electrotechnical equipment in South Korea that would have been vented in a business-as-usual scenario. SF<sub>6</sub> that has been used in the testing of gas insulated electrical equipment (GIEE), especially gas circuit breakers (GCB) and gas insulated switchgears (GIS) at KERI, is recovered and then reclaimed at Solvay's SF<sub>6</sub> manufacturing facility located in Ulsan, South Korea.

**Brief description of the installed technology and equipments:**

Under the project activity, used SF<sub>6</sub> is recovered using a compressor and a piping system and stored in pressurised dedicated recovery cylinders. These cylinders are then transported to a SF<sub>6</sub> manufacturing facility, Solvay Fluor Korea (SFK). At the SFK plant, chemical analysis is used to evaluate the moisture, gaseous and solid decomposition of the recovered gas. After checking that used SF<sub>6</sub> gas fulfils specifications for reclamation, the used SF<sub>6</sub> gas is fed into the new SF<sub>6</sub> production stream through a system of injection piping at a rate of 3 to 10 kg gas/hour. The production line will remove impurities and reclaim the gas to the same purity as new SF<sub>6</sub> in order to be sold in the market.

**Relevant dates for the project activity:**

The project was started on 23 November 2007 and SF<sub>6</sub> recovery equipments at KERI site started commissioning on 29 April 2008.

**Total emission reductions achieved in this monitoring period:**

The total emission reductions for the monitored period account to 107,680 tCO<sub>2</sub>e.

**A.2. Location of project activity**

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Solvay Fluor Korea Co. Ltd: 383, Daejung-Ri, Onsan-Eup, Ulju-kun, Ulsan, Republic of Korea  
Korea Electrotechnology Research Institute: 28-1 Seongju-dong, Changwon-si, Gyeongsangnamdo, Republic of Korea

**A.3. Parties and project participant(s)**

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Solvay Fluor Korea Co. Ltd (Private entity )	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities International Limited (Private entity)	No

**A.4. Reference of applied methodology**

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AM0079 "Recovery of SF<sub>6</sub> from Gas insulated electrical equipment in testing facilities" (version 2)  
"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01)

**A.5. Crediting period of project activity**

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Crediting period type: 10 years (Fixed)

Crediting period: 01/04/2011 ~ 31/03/2021

**SECTION B. Implementation of project activity****B.1. Description of implemented registered project activity**

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The project was started on 23 November 2007 and the commissioning at the recovery site started on 29 April 2008.

The project consists of two sites, one is the SF<sub>6</sub> recovery site and the other is the SF<sub>6</sub> reclamation site. The operational period for both sites is presented in the Table B.1.

Note that recovery-reclamation cylinder *i* refers to each recovery-reclamation cycle that a cylinder goes through (i.e. from the moment the cylinder is taken to the recovery site until the moment the gas contained in the cylinder has been injected into the reclamation facility) and not the physical cylinder. The project uses bundles of two interconnected gas cylinders as its unit of transport; therefore one cylinder *i* for the purposes of the methodology refers to a “bundle”, or two connected physical cylinders, also referred to as the “cylinder bundle”.

**Table B.1 The operational period at KERI and SFK site**

	SF <sub>6</sub> Recovery at KERI site		SF <sub>6</sub> Reclamation at SFK site	
<i>i</i>	Recovery Period from	Recovery Period to	Reclamation Period from	Reclamation Period to
CDM-11003	2-Apr-11	10-Jun-11	19-Jul-11	28-Jul-11
CDM-11004	11-Jun-11	13-Jul-11	23-Aug-11	2-Sep-11
CDM-11005	13-Jul-11	30-Sep-11	25-Oct-11	3-Nov-11
CDM-11006	1-10-11	1-Dec-11	20-Dec-11	29-Dec-11
CDM-11007	2-Dec-11	6-Feb-12	29-Feb-12	9-Mar-12
CDM-12001	8-Feb-12	29-Mar-12	19-Apr-12	26-Apr-12

There was no event occurred during this monitoring period, which may have impact on the applicability of the methodology.

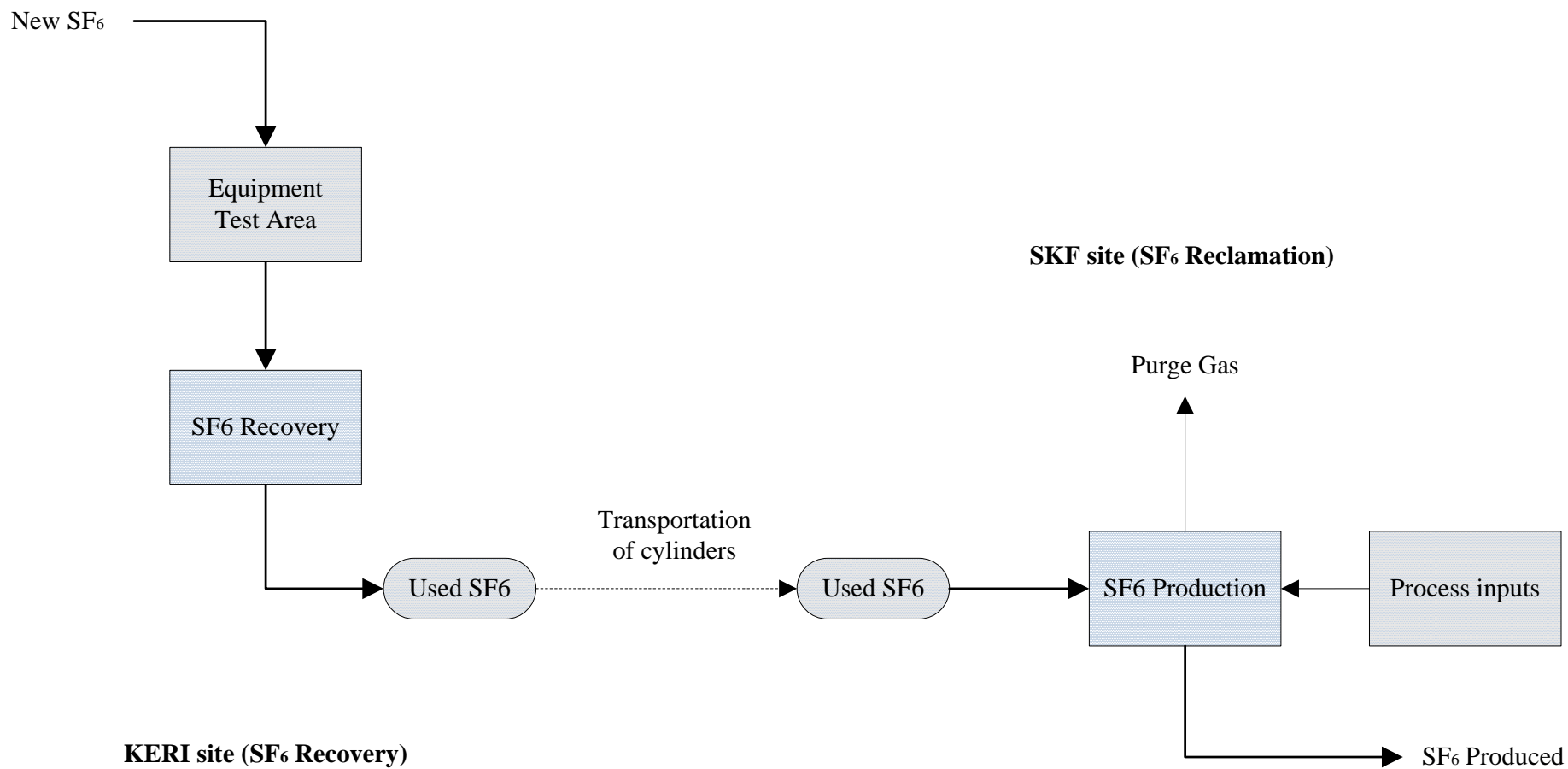


Fig B.1 Diagram of the recovery & reclamation process and the monitoring points

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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**Background information:**

The project activity was registered on 01 Apr 2011 with methodology AM0079 (version 2) applied. In the registered PDD (version 7),  $Q_{SF6,y}$  is required to be monitored to calculate the discount factor ( $DFT_y$ ) for baseline emissions calculation.

$$BE_y = MIN\{V_{SF6,hist}, DFT_y * EA_y\} * GWP_{SF6}$$

Where:

$BE_y$	=	Baseline emissions year $y$ , tCO <sub>2</sub> e
$DFT_y$	=	Discount factor for testing in year $y$
$EA_y$	=	Quantity of SF <sub>6</sub> reclaimed during the year $y$ , tonnes SF <sub>6</sub>
$V_{SF6,hist}$	=	Historical annual baseline venting of SF <sub>6</sub> , tonnes SF <sub>6</sub>
$GWP_{SF6}$	=	Global warming potential of SF <sub>6</sub> , tCO <sub>2</sub> e/tonnes SF <sub>6</sub>

$DFT_y$  is obtained through:

$$DFT_y = \frac{\sum_k (Q_{SF6,k,y} * RT_{k,y})}{Q_{SF6,y}}$$

Where:

$DFT_y$	=	Discount factor for testing in year $y$
$Q_{SF6,k,y}$	=	Total amount of SF <sub>6</sub> filled in the testing of equipments in category $k$ in year $y$ , tonnes SF <sub>6</sub>
$Q_{SF6,y}$	=	Total amount of SF <sub>6</sub> filled in testing of all equipments in the project activity in year $y$ , tonnes SF <sub>6</sub>
$RT_{k,y}$	=	Ratio of number of eligible testing items in category $k$ (maximum value is set at 1)

**Actual measurement situation:**

$Q_{SF6,k,y}$  was not monitored and recorded for the cylinder bundle CDM-11003, CDM-11004 and CDM-11005 during the recovery period from 02 April 2011 to 30 Sep 2011.

**Proposal of a Deviation:**

As  $DFT_y$  can't be estimated without the data of  $Q_{SF6,k,y}$ , a temporary deviation from the applied methodology is proposed as follow:

According to the methodology,  $DFT_y$  is determined through:

$$DFT_y = \frac{\sum_k (Q_{SF6,k,y} * RT_{k,y})}{Q_{SF6,y}}$$

As per the registered PDD, all the equipments were classified into two categories. Therefore,

$$DFT_y = \frac{\sum_k (Q_{SF6,k,y} * RT_{k,y})}{Q_{SF6,y}} = \frac{Q_{SF6,1,y} * RT_{1,y} + Q_{SF6,2,y} * RT_{2,y}}{Q_{SF6,y}}$$

As per the monitoring workbook,  $RT_{1,y} = 1.00$  and  $RT_{2,y} = 0.60$  in the recovery period from 02 April 2011 to 30 Sep 2011 for cylinder bundle CDM-11003, CDM-11004 and CDM-11005.

$RT_{1,y}$  is bigger than  $RT_{2,y}$ . In this case,

$$DFT_y = \frac{\sum_k (Q_{SF6,k,y} * RT_{k,y})}{Q_{SF6,y}} = \frac{Q_{SF6,1,y} * RT_{1,y} + Q_{SF6,2,y} * RT_{2,y}}{Q_{SF6,y}} > \frac{Q_{SF6,1,y} * RT_{2,y} + Q_{SF6,2,y} * RT_{2,y}}{Q_{SF6,y}},$$

And

$$\frac{Q_{SF6,1,y} * RT_{2,y} + Q_{SF6,2,y} * RT_{2,y}}{Q_{SF6,y}} = \frac{RT_{2,y} * (Q_{SF6,1,y} + Q_{SF6,2,y})}{Q_{SF6,y}},$$

For  $Q_{SF6,1,y} + Q_{SF6,2,y} = Q_{SF6,y}$ ,

$$\text{Therefore, } \frac{RT_{2,y} * (Q_{SF6,1,y} + Q_{SF6,2,y})}{Q_{SF6,y}} = \frac{RT_{2,y} * Q_{SF6,y}}{Q_{SF6,y}} = RT_{2,y}.$$

Thus,  $DFT_y > RT_{2,y}$ .

Deviation proposal: the data of  $RT_{2,y}$  being used as the discount factor ( $DFT_y$ ).

It can be concluded from above analysis that the deviation proposal of using the data of  $RT_{2,y}$  to substitute  $DFT_y$  is conservative.

### B.2.2. Corrections

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Not applicable

### B.2.3. Permanent changes from registered monitoring plan or applied methodology

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Not applicable

### B.2.4. Changes to project design of registered project activity

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Not applicable

### B.2.5. Changes to start date of crediting period

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Not applicable

### B.2.6. Types of changes specific to afforestation or reforestation project activity

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Not applicable

## SECTION C. Description of monitoring system

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The monitoring methodology employed is in line with the approved methodology AM0079 (version 2).

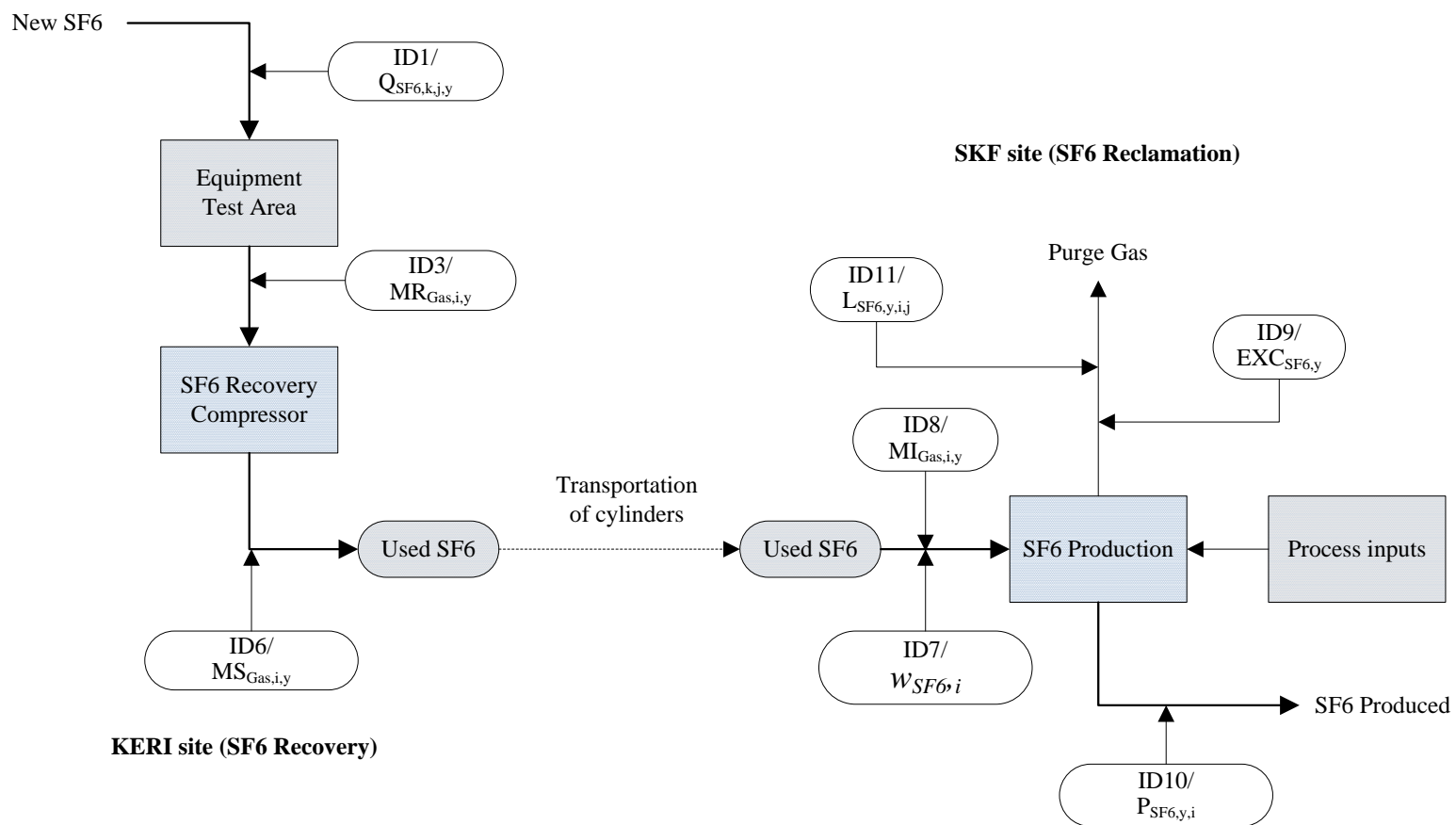


Fig C1. Diagram of the monitoring system

### Project Monitoring Plan

Number	Code	Description	Purpose / Use	Location
1	$Q_{SF_6,k,j,y}$	Mass of $SF_6$ that is filled into equipment $j$ of category $k$ in year $y$ at the $SF_6$ recovery site	Baseline Emissions	$SF_6$ recovery site
2	$NT_{PJ,k,y}$	Average number of total testing items where recovery was done per equipment in the project, for category $k$	Baseline Emissions	$SF_6$ recovery site
3	$MR_{Gas,i,y}$	Mass of used gas that is recovered into cylinder $i$ at the $SF_6$ recovery site in year $y$	Baseline Emissions	$SF_6$ recovery site
4	$i$	Sub-index used for each cylinder that completed a recovery-reclamation cycle included in the estimation of emissions avoided for the year $y$	Baseline Emissions	$SF_6$ recovery site, $SF_6$ reclamation site
5	$n$	Number of cylinders that completed a recovery-reclamation cycle in the year $y$ . Only these cylinders are eligible to be included in the estimation of emissions avoided for the year $y$	Baseline Emissions	$SF_6$ recovery site, $SF_6$ reclamation site
6	$MS_{Gas,i,y}$	Mass of used gas stored in recovery cylinder bundle $i$ in year $y$	Baseline Emissions	$SF_6$ recovery site
7	$w_{SF_6,i}$	Concentration of $SF_6$ in the cylinder $i$	Baseline Emissions	$SF_6$ reclamation site/Laboratory
8	$MI_{Gas,i,y}$	Mass of used gas from cylinder $i$ which is injected for reclamation	Baseline Emissions	$SF_6$ reclamation site
9	$EXC_{SF_6,y}$	Quantity of $SF_6$ which was being injected to the reclamation facility during exceptional events occurred in year $y$	Project Emissions	$SF_6$ reclamation site
10	$P_{SF_6,i,y}$	Production of $SF_6$ during the reclamation period of cylinder $i$ , in year $y$	Project Emissions	$SF_6$ reclamation site
11	$L_{SF_6,y,i,j}$	Amount of $SF_6$ loss from point $j$ during the reclamation period of cylinder $i$ in year $y$	Project Emissions	$SF_6$ reclamation site

#### 1. Monitoring organization

Each of the Project sites, the  $SF_6$  recovery site (KERI) and the  $SF_6$  reclamation site (SFK), designates an on-site CDM coordinator. The CDM coordinators have the overall responsibility for the relevant monitoring of emissions reductions of the project activity according to the monitoring plan. The CDM coordinators report regularly to their respective senior management. All other technical staff which is involved in the data collection process has defined roles and responsibilities. Staff will be trained on CDM monitoring requirements. Records of trained CDM staff will be retained. The overall monitoring responsibility for both the SFK and KERI sites will be with the CDM coordinator of the  $SF_6$  reclamation site (SFK).

#### 2. Monitoring equipment

The primary equipment used for the monitoring of CDM parameters project is the following:



(i) Weighing scale: A weighing scale is used for weighing the cylinders in a bundle at the SF<sub>6</sub> recovery site. The scale will be appropriately calibrated.

(ii) Flow meter: Flow meters are used to quantify the amount of SF<sub>6</sub> both at the SF<sub>6</sub> recovery and reclamation sites. The flow meters will be appropriately calibrated.

(iii) Gas chromatograph: The SF<sub>6</sub> content of the used gas in each cylinder bundle will be analyzed using a gas chromatography. The equipment will be appropriately calibrated.

Two cylinders filled with used SF<sub>6</sub> as one cylinder bundle are transported to the reclamation site with each cylinder bundle clearly identified and marked. Upon arrival at the SF<sub>6</sub> reclamation site, each cylinder bundle would be analysed, to determine the proportion of SF<sub>6</sub> gas and the proportion of impurities.

### 3. Data and records management

Data monitored for CDM purposes would be recorded once the cylinder bundle is filled with SF<sub>6</sub> and filed electronically. All relevant data will be archived electronically, and backed up regularly. Moreover, it will be kept for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs for this project activity (whichever occurs later). The electronic files will be backed up. The CDM Coordinators will be responsible for checking the data quality and will be responsible for managing the collection, storage and archiving of all data and records.

### 4. Quality Assurance

All data collected is checked by the CDM coordinators. Procedures are in place to ensure consistent quality of all data collection, recording, storage, reporting and possible monitoring data adjustments and uncertainties as well as emergencies. Moreover, regular internal audits are conducted to assure that the project is in compliance with operational and CDM requirements.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

*(Copy this table for each piece of data and parameter.)*

Data/Parameter	GWP <sub>SF6</sub>
Unit	tCO <sub>2</sub> e/tSF <sub>6</sub>
Description	Global warming potential of SF <sub>6</sub>
Source of data	IPCC 2nd assessment report
Value(s) applied	23,900
Purpose of data	Baseline emissions calculation
Additional comment	Shall be updated according to any future COP/MOP decisions



<b>Data/Parameter</b>	-
<b>Unit</b>	MW
<b>Description</b>	Rated capacity of the operating equipment used for project activity of the testing facilities at recovery site and reclamation site in year y
<b>Source of data</b>	Records at recovery and reclamation sites
<b>Value(s) applied</b>	At recovery site = 0.0169 corresponds to total capacity of following corresponding equipments, <ol style="list-style-type: none"> <li>1. Two Compressors – 10kW</li> <li>2. Suctioning Pump – 0.6 kW</li> <li>3. Vacuum Pump – 1.5kW</li> <li>4. Evaporator – 4.8kW</li> </ol> Total: 16.9kW = 0.0169MW At reclamation site = 0.000006, corresponds to the following equipment, <ol style="list-style-type: none"> <li>1. One flow meter – 6 W</li> </ol>
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	The specification of the above monitoring instruments will be checked

<b>Data/Parameter</b>	$EF_{elec,j,y}$
<b>Unit</b>	tCO <sub>2</sub> e/MWh
<b>Description</b>	Emissions factor for electricity consumed by process “j” in year “y”
<b>Source of data</b>	The registered PDD
<b>Value(s) applied</b>	1.30
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	As per the description in the registered PDD, the emission factor of grid electricity in Korea is around 0.56tCO <sub>2</sub> e/MWh. Hence, 1.3 is considered to be a conservative assumption Value to be fixed during all the crediting period

<b>Data/Parameter</b>	$TDL_{j,y}$
<b>Unit</b>	-
<b>Description</b>	Average technical transmission and distribution losses for providing electricity to source j year y
<b>Source of data</b>	The registered PDD, and the adopted value is in line with “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
<b>Value(s) applied</b>	20%
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	-



<b>Data/Parameter</b>	$TI_{SF_6,used,t}$
<b>Unit</b>	tonnes gas
<b>Description</b>	Used gas vented during eligible testing item for the historical baseline year
<b>Source of data</b>	The registered PDD
<b>Value(s) applied</b>	6.9452
<b>Purpose of data</b>	Baseline emissions calculation
<b>Additional comment</b>	-

<b>Data/Parameter</b>	$NT_{BL,k}$
<b>Unit</b>	-
<b>Description</b>	Average number of eligible testing items where venting occurred per equipment in the baseline, for category k
<b>Source of data</b>	The registered PDD
<b>Value(s) applied</b>	For k category 40 - 419kV, $NT_{BL,1}$ : 2.76 For k category 420 - 800 kV, $NT_{BL,2}$ : 1.90
<b>Purpose of data</b>	Baseline emissions calculation
<b>Additional comment</b>	-

<b>Data/Parameter</b>	$L_{SF_6,hist,j}$
<b>Unit</b>	tonnes $SF_6$
<b>Description</b>	Historical amount of $SF_6$ loss from point j, tonnes $SF_6$
<b>Source of data</b>	The registered PDD and it's estimated according to the records of the $SF_6$ reclamation site
<b>Value(s) applied</b>	0.434
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	-

<b>Data/Parameter</b>	$P_{SF_6,hist}$
<b>Unit</b>	tonnes $SF_6$
<b>Description</b>	Production of $SF_6$ during the historical period, tonnes $SF_6$
<b>Source of data</b>	The registered PDD and it's estimated according to the records of the $SF_6$ reclamation site
<b>Value(s) applied</b>	748.608
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	-

**D.2. Data and parameters monitored***(Copy this table for each piece of data and parameter.)*

<b>Data/Parameter</b>	<b>GWP<sub>SF6</sub></b>
<b>Unit</b>	tCO <sub>2</sub> e/tSF <sub>6</sub>
<b>Description</b>	Global warming potential of SF <sub>6</sub>
<b>Measured/Calculated /Default</b>	Default
<b>Source of data</b>	IPCC 2nd assessment report
<b>Value(s) of monitored parameter</b>	23,900 The value of the parameter is fixed for the first commitment period and shall be updated according to any future COP/MOP decisions
<b>Monitoring equipment</b>	-
<b>Measuring/Reading/ Recording frequency</b>	-
<b>Calculation method (if applicable)</b>	-
<b>QA/QC procedures</b>	-
<b>Purpose of data</b>	Baseline emissions calculation
<b>Additional comment</b>	-



Data/Parameter	W <sub>SF6,BL,hist,y</sub>																		
Unit	tonnes SF <sub>6</sub> / tonnes gas																		
Description	Concentration of SF <sub>6</sub> in used gas in the baseline, to be used as a substitute for <i>w<sub>SF6,hist</sub></i> where the record of the concentration of SF <sub>6</sub> in the gas vented in the baseline is not available																		
Measured/Calculated /Default	Measured																		
Source of data	Laboratory test results																		
Value(s) of monitored parameter	<table><tr><td>i</td><td>Value</td></tr><tr><td>CDM-11003</td><td>99.53%</td></tr><tr><td>CDM-11004</td><td>97.18%</td></tr><tr><td>CDM-11005</td><td>99.62%</td></tr><tr><td>CDM-11006</td><td>98.27%</td></tr><tr><td>CDM-11007</td><td>99.22%</td></tr><tr><td>CDM-12001</td><td>99.58%</td></tr><tr><td>W<sub>SF6,BL,hist,y</sub></td><td>98.90%</td></tr></table>			i	Value	CDM-11003	99.53%	CDM-11004	97.18%	CDM-11005	99.62%	CDM-11006	98.27%	CDM-11007	99.22%	CDM-12001	99.58%	W <sub>SF6,BL,hist,y</sub>	98.90%
i	Value																		
CDM-11003	99.53%																		
CDM-11004	97.18%																		
CDM-11005	99.62%																		
CDM-11006	98.27%																		
CDM-11007	99.22%																		
CDM-12001	99.58%																		
W <sub>SF6,BL,hist,y</sub>	98.90%																		
Monitoring equipment	<table><tr><td>Monitoring equipment</td><td>Gas Chromatograph</td></tr><tr><td>Serial No.</td><td>CN10622030</td></tr><tr><td>Calibration frequency</td><td>2 years</td></tr><tr><td>Accuracy</td><td>-</td></tr><tr><td>Calibration Agency</td><td>SFK</td></tr><tr><td>Date of calibration</td><td>11 Feb 2010</td></tr><tr><td></td><td>14 May 2011</td></tr><tr><td>Validity of calibration</td><td>2 years</td></tr></table>			Monitoring equipment	Gas Chromatograph	Serial No.	CN10622030	Calibration frequency	2 years	Accuracy	-	Calibration Agency	SFK	Date of calibration	11 Feb 2010		14 May 2011	Validity of calibration	2 years
Monitoring equipment	Gas Chromatograph																		
Serial No.	CN10622030																		
Calibration frequency	2 years																		
Accuracy	-																		
Calibration Agency	SFK																		
Date of calibration	11 Feb 2010																		
	14 May 2011																		
Validity of calibration	2 years																		
Measuring/Reading/ Recording frequency	The gas sample is collected every time a cylinder bundle arrives at SFK plant. This sample is analyzed in SFK laboratory using Gas Chromatography tests in accordance with the internal Standard Operational Procedure (SOP). The detection limit of all the gases analysed will be at least 50 ppm.																		
Calculation method (if applicable)	-																		
QA/QC procedures	The SOP uses ASTM D 2685, ASTM D 2029, ASTM D 2284, Din IEC 60376, VDE 0373, ASTM 2472 and/or other sector, national or international Standards.																		
Purpose of data	Baseline emissions calculation																		
Additional comment	This variable does not exist in equations, however provided in monitoring table to be used as substitute to the variable <i>w<sub>SF6,hist</sub></i> , for the cases where the record of the concentration of SF <sub>6</sub> in the gas vented in the baseline is not available																		



<b>Data/Parameter</b>	$Q_{SF6,k,j,y}$		
<b>Unit</b>	tonnes SF <sub>6</sub>		
<b>Description</b>	Mass of SF <sub>6</sub> that is filled into equipment j of category k in the year y at the SF <sub>6</sub> recovery site		
<b>Measured/Calculated/Default</b>	Measured		
<b>Source of data</b>	Records from the SF <sub>6</sub> recovery site		
<b>Value(s) of monitored parameter</b>	<p>As the data of <math>Q_{SF6,k,y}</math> was not available for the cylinder bundle CDM-11003, CDM-11004 and CDM-11005 (Please refer to B.2.1 for more detailed analysis), the data of <math>Q_{SF6,k,j,y}</math> for the cylinder bundle CDM-11006, CDM-11007 and CDM-12001 during the recovery period from 1 Oct 2011 - 26 Apr 2012 is listed below.</p> <p>During the monitoring period, the equipments ranging from 12 to 800 KV were tested so the range is set at 12 KV to 800 KV and the categories are: 12 to 405 KV and 406 to 800 KV, so <math>Q_{SF6,1,y}</math> represents the total amount of SF<sub>6</sub> filled in the testing of equipments in category 1 (12 to 405KV) in year y and <math>Q_{SF6,2,y}</math> represents the total amount of SF<sub>6</sub> filled in the testing of equipments in category 2 (406 to 800 KV) in year y.</p> <p><math>Q_{SF6,1} = 3.12</math>, for the cylinder bundles CDM-11006~CDM12001;  <math>Q_{SF6,2} = 1.10</math>, for the cylinder bundles CDM-11006~CDM12001;</p>		
<b>Monitoring equipment</b>	<b>Monitoring equipment</b>	<b>Mass flow meter</b>	<b>Mass flow meter</b>
	Serial No.	14122007	14111339
	Calibration frequency	5years, recommended by FMTech Co., Ltd	5years, recommended by FMTech Co., Ltd
	Accuracy	±0.100%	±0.100%
	Calibration Agency	FMTech Co., Ltd	FMTech Co., Ltd
	Date of calibration	05 Feb 2009	21 Nov 2008
		25 May 2012	21 May 2012
	Validity of calibration	5 years	5 years
<b>Measuring/Reading/Recording frequency</b>	Measuring continuously and recording after each injection		
<b>Calculation method (if applicable)</b>	-		
<b>QA/QC procedures</b>	Meters subject to regular calibration according to standard FMT-QG-06		
<b>Purpose of data</b>	Baseline emissions calculation		
<b>Additional comment</b>	-		



Data/Parameter	MR <sub>Gas,i,y</sub>		
Unit	tonnes gas		
Description	Mass of used SF <sub>6</sub> recovered into cylinder bundle i at the SF <sub>6</sub> recovery site in year y		
Measured/Calculated /Default	Measured		
Source of data	Records from the SF <sub>6</sub> recovery site		
Value(s) of monitored parameter		i	MR <sub>Gas</sub> (kg)
		CDM-11003	1024.61
		CDM-11004	1097.67
		CDM-11005	1074.38
		CDM-11006	1106.85
		CDM-11007	1059.30
		CDM-12001	1176.44
		Sum	6539.25
Monitoring equipment		Monitoring equipment	Mass flow meter
		Serial No.	14069408
		Calibration frequency	5years, recommended by FMTech Co., Ltd
		Accuracy	±0.100%
		Calibration Agency	FMTech Co., Ltd
		Date of calibration	27 May 2009
			25 May 2012
		Validity of calibration	5 years
Measuring/Reading/ Recording frequency	Measuring continuously and recording after each recovery of the SF <sub>6</sub> being vented		
Calculation method (if applicable)	-		
QA/QC procedures	Meter subject to regular calibration according to standard FMT-QG-06		
Purpose of data	Baseline emissions calculation		
Additional comment	-		



<b>Data/Parameter</b>	<b>MS<sub>Gas,i,y</sub></b>																
<b>Unit</b>	Tonnes of gas																
<b>Description</b>	Mass of used gas stored in recovery cylinder bundle i in year y																
<b>Measured/Calculated/Default</b>	Measured																
<b>Source of data</b>	Records from SF6 recovery site																
<b>Value(s) of monitored parameter</b>	<table> <tr> <th>i</th><th>MS<sub>Gas</sub> (kg)</th></tr> <tr> <td>CDM-11003</td><td>1020.00</td></tr> <tr> <td>CDM-11004</td><td>1080.00</td></tr> <tr> <td>CDM-11005</td><td>973.50</td></tr> <tr> <td>CDM-11006</td><td>1058.50</td></tr> <tr> <td>CDM-11007</td><td>1014.00</td></tr> <tr> <td>CDM-12001</td><td>1179.00</td></tr> <tr> <td>Sum</td><td>6325.00</td></tr> </table>	i	MS <sub>Gas</sub> (kg)	CDM-11003	1020.00	CDM-11004	1080.00	CDM-11005	973.50	CDM-11006	1058.50	CDM-11007	1014.00	CDM-12001	1179.00	Sum	6325.00
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Validity of calibration	2 years																
<b>Measuring/Reading/Recording frequency</b>	Measuring and recording for each bundle of cylinders																
<b>Calculation method (if applicable)</b>	-																
<b>QA/QC procedures</b>	Meter subject to regular calibration according to standard KML-CAL-M05 and PH-I003																
<b>Purpose of data</b>	Baseline emissions calculation																
<b>Additional comment</b>	-																





<b>Data/Parameter</b>	<b>MI<sub>Gas,i,y</sub></b>																
<b>Unit</b>	Tonnes of gas																
<b>Description</b>	Mass of used gas from the cylinder bundle i injected into the production process for reclamation process in year y																
<b>Measured/Calculated/Default</b>	Measured																
<b>Source of data</b>	Records from SF <sub>6</sub> recovery site																
<b>Value(s) of monitored parameter</b>	<table> <tr> <th>i</th><th>MI<sub>Gas</sub> (kg)</th></tr> <tr> <td>CDM-11003</td><td>970.40</td></tr> <tr> <td>CDM-11004</td><td>959.54</td></tr> <tr> <td>CDM-11005</td><td>930.97</td></tr> <tr> <td>CDM-11006</td><td>1,016.15</td></tr> <tr> <td>CDM-11007</td><td>977.34</td></tr> <tr> <td>CDM-12001</td><td>1,148.66</td></tr> <tr> <td>Sum</td><td>6,003.04</td></tr> </table>	i	MI <sub>Gas</sub> (kg)	CDM-11003	970.40	CDM-11004	959.54	CDM-11005	930.97	CDM-11006	1,016.15	CDM-11007	977.34	CDM-12001	1,148.66	Sum	6,003.04
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Date of calibration	08 Jun 2009																
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Validity of calibration	5 years																
<b>Measuring/Reading/Recording frequency</b>	Measuring continuously and recording after each injection of the SF <sub>6</sub> into the SF <sub>6</sub> production line																
<b>Calculation method (if applicable)</b>	-																
<b>QA/QC procedures</b>	Meter subject to regular calibration according to standard FMT-QG-06																
<b>Purpose of data</b>	Baseline emissions calculation																
<b>Additional comment</b>	-																



<b>Data/Parameter</b>	$L_{SF_6,y,i,j}$																
<b>Unit</b>	Tonnes SF <sub>6</sub>																
<b>Description</b>	Amount of SF <sub>6</sub> loss from point j during the reclamation period of cylinder i in year y																
<b>Measured/Calculated/Default</b>	Measured The measurement period is the period in which cylinder i is connected for gas reclamation																
<b>Source of data</b>	Records from SF <sub>6</sub> reclamation site																
<b>Value(s) of monitored parameter</b>	<table border="1"> <thead> <tr> <th><i>i</i></th><th><math>L_{SF_6,y,i,j}</math> (kg)</th></tr> </thead> <tbody> <tr> <td>CDM-11003</td><td>63.2</td></tr> <tr> <td>CDM-11004</td><td>36.5</td></tr> <tr> <td>CDM-11005</td><td>51.5</td></tr> <tr> <td>CDM-11006</td><td>17.6</td></tr> <tr> <td>CDM-11007</td><td>21.8</td></tr> <tr> <td>CDM-12001</td><td>21.7</td></tr> </tbody> </table>	<i>i</i>	$L_{SF_6,y,i,j}$ (kg)	CDM-11003	63.2	CDM-11004	36.5	CDM-11005	51.5	CDM-11006	17.6	CDM-11007	21.8	CDM-12001	21.7		
<i>i</i>	$L_{SF_6,y,i,j}$ (kg)																
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	24 May 2012																
Validity of calibration	5 years																
<b>Measuring/Reading/Recording frequency</b>	Measuring continuously and recording daily																
<b>Calculation method (if applicable)</b>	$L_{SF_6,y,i,j}$ = Daily purge mass amount of gas × Volume% of SF <sub>6</sub>																
<b>QA/QC procedures</b>	Meter subject to regular calibration according to standard FMT-QG-06																
<b>Purpose of data</b>	Project emissions reduction																
<b>Additional comment</b>	-																



Data/Parameter	$P_{SF_6,y,i}$														
Unit	Tonnes SF <sub>6</sub>														
Description	Production of SF <sub>6</sub> during the reclamation period of cylinder <i>i</i> , in year <i>y</i>														
Measured/Calculated/Default	Measured														
Source of data	Records from regular production monitoring at SF <sub>6</sub> reclamation site														
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th><i>i</i></th><th><math>P_{SF_6,y,i}</math> (kg)</th></tr> </thead> <tbody> <tr> <td>CDM-11003</td><td>45,107</td></tr> <tr> <td>CDM-11004</td><td>46,656</td></tr> <tr> <td>CDM-11005</td><td>35,930</td></tr> <tr> <td>CDM-11006</td><td>32,523</td></tr> <tr> <td>CDM-11007</td><td>42,488</td></tr> <tr> <td>CDM-12001</td><td>29,754</td></tr> </tbody> </table>	<i>i</i>	$P_{SF_6,y,i}$ (kg)	CDM-11003	45,107	CDM-11004	46,656	CDM-11005	35,930	CDM-11006	32,523	CDM-11007	42,488	CDM-12001	29,754
<i>i</i>	$P_{SF_6,y,i}$ (kg)														
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CDM-11007	42,488														
CDM-12001	29,754														
Monitoring equipment	<p>There are two storage tanks, so called daily tank, which are operated alternatively day by day. Daily production amount is stored to A and B tank alternatively day by day for quality check and is transferred to a third big storage tank (weekly tanks) for SF<sub>6</sub> filling work.</p> <p>As SF<sub>6</sub> is a liquefied gas in the storage tank, it is difficult to measure the amount directly so by measuring the difference of tank level (volume), temperature and pressure of daily tank between certain time point of the day to the time point of next day, the daily production amount is calculated.</p>														
Measuring/Reading/Recording frequency	Measured and recorded daily														
Calculation method (if applicable)	-														
QA/QC procedures	<p>The measurement period is the period in which cylinder <i>i</i> is connected for gas reclamation, as measured in days. Production to be measured daily.</p> <p>The production measurement will follow the Specific Operational Procedure (SOP) SFK-SOP-SF6-086, where is defined the detailed procedure, the responsible for measuring it, the reporting system and the equipments (Level gauge, pressure, temperature of daily tank) used to measure. The accuracy of each monitoring equipment will be at least:</p> <p>Level gauge : ±50mm  Pressure gauge : ± 0.5%  Temperature : ± 0.5 %</p>														
Purpose of data	Project emissions reduction														
Additional comment	-														



Data/Parameter	NT <sub>PJ,k,y</sub>											
Unit	N/A											
Description	Average number of total testing items where recovery was done per equipment in the project, for category k											
Measured/Calculated /Default	Calculated In the registered PDD, it states that the equipments ranging from 40 KV to 800 KV were tested in the historic baseline period, and two categories were formed: 40 to 419 KV and 420 KV to 800 kV. NT <sub>BL,1</sub> and NT <sub>BL,2</sub> were calculated based on the historical records in the registered PDD. During the monitoring period, the equipments ranging from 12 to 800 KV were tested so the range is set at 12 KV to 800 KV and the categories are: 12 to 405 KV and 406 to 800 KV.											
Source of data	Records from the SF <sub>6</sub> recovery site											
Value(s) of monitored parameter	<table><tr><td></td><td>CDM-11003~ CDM-11005</td><td>CDM-11006~ CDM-12001</td></tr><tr><td>NT<sub>PJ,1</sub> (for category: 12~405 kV)</td><td>2.26</td><td>2.05</td></tr><tr><td>NT<sub>PJ,2</sub> (for category: 406~800 kV)</td><td>3.14</td><td>2.67</td></tr></table>				CDM-11003~ CDM-11005	CDM-11006~ CDM-12001	NT <sub>PJ,1</sub> (for category: 12~405 kV)	2.26	2.05	NT <sub>PJ,2</sub> (for category: 406~800 kV)	3.14	2.67
	CDM-11003~ CDM-11005	CDM-11006~ CDM-12001										
NT <sub>PJ,1</sub> (for category: 12~405 kV)	2.26	2.05										
NT <sub>PJ,2</sub> (for category: 406~800 kV)	3.14	2.67										
Monitoring equipment	-											
Measuring/Reading/Recording frequency	-											
Calculation method (if applicable)	Count the number of testing items where gas was recovered for the year y, by referring to the testing records compiled during the project year at the SF <sub>6</sub> recovery site. Count the number of equipment in each category for the year y, by referring to the testing records compiled during the project year at the SF <sub>6</sub> recovery site. For each category k, make an average of the counts for equipment in that category to derive NT <sub>PJ,k,y</sub>											
QA/QC procedures	-											
Purpose of data	Baseline emissions reduction											
Additional comment	-											



<b>Data/Parameter</b>	<i>i</i>
<b>Unit</b>	N/A
<b>Description</b>	Sub-index used for each cylinder bundle that completed a recovery-reclamation cycle included in the estimation of emissions avoided for the year y
<b>Measured/Calculated/Default</b>	-
<b>Source of data</b>	Records from the SF <sub>6</sub> recovery site and SF <sub>6</sub> reclamation site
<b>Value(s) of monitored parameter</b>	CDM-11003 CDM-11004 CDM-11005 CDM-11006 CDM-11007 CDM-12001
<b>Monitoring equipment</b>	-
<b>Measuring/Reading/Recording frequency</b>	-
<b>Calculation method (if applicable)</b>	-
<b>QA/QC procedures</b>	When used gas is filled into a recovery cylinder bundle, weighed, and sent for reclaiming, the activity should be noted using the cylinder bundle identification information
<b>Purpose of data</b>	-
<b>Additional comment</b>	Recovery cylinder bundles must be visibly distinguishable from new gas cylinder bundles. Records from both sites should coincide An individual cylinder bundle may be used more than one time per year, i.e. it may go through the recovery-reclamation process more than once. However, the labelling will show the unique identity of each cylinder bundle as it is involved in one recovery- reclamation process



<b>Data/Parameter</b>	<b>n</b>
<b>Unit</b>	N/A
<b>Description</b>	Number of cylinder bundles that completed a recovery-reclamation cycle in the year y. Only these cylinder bundles are eligible to be included in the estimation of emissions avoided for the year y
<b>Measured/Calculated/Default</b>	-
<b>Source of data</b>	Records from the SF <sub>6</sub> recovery site and SF <sub>6</sub> reclamation site
<b>Value(s) of monitored parameter</b>	-
<b>Monitoring equipment</b>	-
<b>Measuring/Reading/Recording frequency</b>	-
<b>Calculation method (if applicable)</b>	-
<b>QA/QC procedures</b>	The site keeps records of each cylinder bundle i for which recovery and reclamation has been completed. All individual identification and dates information are available for a clear definition of each year y the process was finished.
<b>Purpose of data</b>	-
<b>Additional comment</b>	Records from both sites should coincide. In the case in which a cylinder bundle has not completed reclamation in year y, it will be accounted in year y+1 as mentioned in Step 2 of baseline emissions of the methodology



<b>Data/Parameter</b>	$W_{SF_6,i}$															
<b>Unit</b>	Tonnes SF <sub>6</sub> / tonnes gas															
<b>Description</b>	Concentration of SF <sub>6</sub> in the cylinder bundle i															
<b>Measured/Calculated/Default</b>	Measured															
<b>Source of data</b>	laboratory test result															
<b>Value(s) of monitored parameter</b>	<table> <tr> <th>i</th><th><math>W_{SF_6,i}</math></th></tr> <tr> <td>CDM-11003</td><td>99.53%</td></tr> <tr> <td>CDM-11004</td><td>97.18%</td></tr> <tr> <td>CDM-11005</td><td>99.62%</td></tr> <tr> <td>CDM-11006</td><td>98.27%</td></tr> <tr> <td>CDM-11007</td><td>99.22%</td></tr> <tr> <td>CDM-12001</td><td>99.58%</td></tr> </table>	i	$W_{SF_6,i}$	CDM-11003	99.53%	CDM-11004	97.18%	CDM-11005	99.62%	CDM-11006	98.27%	CDM-11007	99.22%	CDM-12001	99.58%	
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Date of calibration	11 Feb 2010															
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Validity of calibration	2 years															
<b>Measuring/Reading/Recording frequency</b>	The gas sample is collected every time a cylinder bundle arrives in SFK plant. This sample is analyzed in SFK laboratory using Gas Chromatography tests in accordance with the internal Standard Operational Procedure (SOP). The detection limit of all the gases analysed is at least 50 ppm.															
<b>Calculation method (if applicable)</b>	-															
<b>QA/QC procedures</b>	The SOP uses ASTM D 2685, ASTM D 2029, ASTM D 2284, Din IEC 60376, VDE 0373, ASTM 2472 and/or other sector, national or international Standards.															
<b>Purpose of data</b>	Baseline emissions calculation															
<b>Additional comment</b>	Given that the recovery and reclamation process are batch processes, and that the concentration of SF <sub>6</sub> in the used gas remains constant after recovery and before reclamation, $W_{SF_6,i}$ needs to be measured only once per cylinder bundle to determine the proportion of SF <sub>6</sub> in the gas contained in that cylinder bundle.															



<b>Data/Parameter</b>	<b>PE<sub>TF,y</sub></b>
<b>Unit</b>	tCO <sub>2</sub> e
<b>Description</b>	Project emissions as a result of increased electricity consumption at the testing facility attributable to project activity in year y
<b>Measured/Calculated/Default</b>	Calculated
<b>Source of data</b>	Records from SF <sub>6</sub> testing facility
<b>Value(s) of monitored parameter</b>	6.64
<b>Monitoring equipment</b>	-
<b>Measuring/Reading/Recording frequency</b>	-
<b>Calculation method (if applicable)</b>	Follow the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”; Electricity consumption approximated by the rated capacity of the operating equipment multiplied by operating hours of the equipment. Please refer to Section E.2
<b>QA/QC procedures</b>	-
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	

<b>Data/Parameter</b>	<b>PE<sub>RF,y</sub></b>
<b>Unit</b>	tCO <sub>2</sub> e
<b>Description</b>	Project emissions as a result of increased electricity consumption at the reclamation facility attributable to project activity in year y
<b>Measured/Calculated/Default</b>	Calculated
<b>Source of data</b>	Records from SF <sub>6</sub> reclamation facility
<b>Value(s) of monitored parameter</b>	0.08
<b>Monitoring equipment</b>	-
<b>Measuring/Reading/Recording frequency</b>	-
<b>Calculation method (if applicable)</b>	Electricity consumption approximated by the rated capacity of the operating equipment multiplied by operating hours of the equipment and a conservative approach of 8760 hours per year is used. Please refer to Section E.2
<b>QA/QC procedures</b>	-
<b>Purpose of data</b>	Project emissions calculation
<b>Additional comment</b>	-





<b>Data/Parameter</b>	<b><math>EXC_{SF_6,y}</math></b>																
<b>Unit</b>	Tonnes $SF_6$																
<b>Description</b>	Quantity of $SF_6$ which was being injected to the reclamation facility during exceptional events occurred in year y																
<b>Measured/Calculated/Default</b>	Measured																
<b>Source of data</b>	Records from $SF_6$ reclamation facility																
<b>Value(s) of monitored parameter</b>	<table> <tr> <th><math>i</math></th><th><math>EXC_{SF_6,y}</math> (kg)</th></tr> <tr> <td>CDM-11003</td><td>0.000</td></tr> <tr> <td>CDM-11004</td><td>0.048</td></tr> <tr> <td>CDM-11005</td><td>0.024</td></tr> <tr> <td>CDM-11006</td><td>0.000</td></tr> <tr> <td>CDM-11007</td><td>0.000</td></tr> <tr> <td>CDM-12001</td><td>0.014</td></tr> <tr> <td>Sum</td><td>0.086</td></tr> </table>	$i$	$EXC_{SF_6,y}$ (kg)	CDM-11003	0.000	CDM-11004	0.048	CDM-11005	0.024	CDM-11006	0.000	CDM-11007	0.000	CDM-12001	0.014	Sum	0.086
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CDM-12001	0.014																
Sum	0.086																
<b>Monitoring equipment</b>	<table> <tr> <th>Monitoring equipment</th><th>Mass flow meter</th></tr> <tr> <td>Serial No.</td><td>14014422</td></tr> <tr> <td>Calibration frequency</td><td>5years, recommended by FMTech Co., Ltd</td></tr> <tr> <td>Accuracy</td><td><math>\pm 0.100\%</math></td></tr> <tr> <td>Calibration Agency</td><td>FMTech Co., Ltd</td></tr> <tr> <td>Date of calibration</td><td>08 Jun 2009 21 May 2012</td></tr> <tr> <td>Validity of calibration</td><td>5 years</td></tr> </table>	Monitoring equipment	Mass flow meter	Serial No.	14014422	Calibration frequency	5years, recommended by FMTech Co., Ltd	Accuracy	$\pm 0.100\%$	Calibration Agency	FMTech Co., Ltd	Date of calibration	08 Jun 2009 21 May 2012	Validity of calibration	5 years		
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Date of calibration	08 Jun 2009 21 May 2012																
Validity of calibration	5 years																
<b>Measuring/Reading/Recording frequency</b>	<p>The project proponent records the date and time of any exceptional event that occurs in year y that results in the unusual emission of <math>SF_6</math>. The <math>SF_6</math> quantity (<math>EXC_{SF_6,y}</math>) from any reclamation that coincides with the event must be considered as project emissions (<math>PE_{EXC,y}</math>).</p> <p>For example, if a cylinder bundle of used gas was being reclaimed when the event occurred, then the total amount of gas from the cylinder bundle between 5 hours prior to the event and until the time that the injection line was shut off must be considered as <math>EXC_{SF_6,y}</math>.</p> <p>The total amount of gas is to be taken from the continuous measurement of the flow meter on the injection line used to determine <math>MI_{Gas,i}</math>.</p>																
<b>Calculation method (if applicable)</b>	-																
<b>QA/QC procedures</b>	-																
<b>Purpose of data</b>	Project emissions calculation																
<b>Additional comment</b>	-																

### D.3. Implementation of sampling plan

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N/A

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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#### Baseline Emission Reduction Calculations

In this section the baseline emission reduction calculation equation is explained. The formula for calculation of Emission Reductions is:

$$BE_y = MIN\{V_{SF6,hist}, DFT_y * EA_y\} * GWP_{SF6}$$

Where:

$BE_y$	=	Baseline emissions year y, tCO <sub>2</sub> e
$DFT_y$	=	Discount factor for testing in year y
$EA_y$	=	Quantity of SF <sub>6</sub> reclaimed during the year y, tonnes SF <sub>6</sub>
$V_{SF6,hist}$	=	Historical annual baseline venting of SF <sub>6</sub> , tonnes SF <sub>6</sub>
$GWP_{SF6}$	=	Global warming potential of SF <sub>6</sub> , tCO <sub>2</sub> e/tonnes SF <sub>6</sub>

#### Results:

	Parameter	Value	Reference
CDM-11003 CDM-11004 CDM-11005 (CDM-11003~CDM-11005)	$DFT_y$	0.60	Calculated
	$EA_y$	2.83	Measured
	$V_{SF6,hist}$	3.42	Calculated
	$GWP_{SF6}$	23,900	default
	$BE_y$	40,828	Calculated
CDM-11006 CDM-11007 CDM-12001 (CDM-11006~CDM12001)	$DFT_y$	0.93	Calculated
	$EA_y$	3.11	Measured
	$V_{SF6,hist}$	3.41	Calculated
	$GWP_{SF6}$	23,900	default
	$BE_y$	68,819	Calculated
<b>Sum</b>	$BE_y$	109,647	Calculated

#### Step1: Calculation of $V_{SF6,hist}$ :

$$V_{SF6,hist} = w_{SF6,hist} \sum_t TI_{SF6,used,t}$$

Where:

$TI_{SF6,used,t}$	=	Used gas vented during eligible testing item t, tonnes gas
$w_{SF6,hist}$	=	Concentration of SF <sub>6</sub> expected in used gas in the historical period, tonnes SF <sub>6</sub> /tonnes gas

#### Results:

Parameter	Value	Reference
$\sum TI_{SF6,used,t}$	6.95	The registered PDD
$\sum TI_{SF6,used,t}$ CDM-11003~CDM-11005	3.46	Calculated in a conservative way (refer to the Monitoring Workbook)
$TI_{SF6,used,t}$ CDM-11006~CDM12001	3.44	Calculated in a conservative way (refer to the Monitoring Workbook)
$w_{SF6,hist}$	98.9%	Measured (refer to D.2)
$V_{SF6,hist}$ CDM-11003~CDM-11005	3.42	Calculated (refer to the Monitoring Workbook)
$V_{SF6,hist}$	3.41	Calculated

CDM-11003~CDM-12001		(refer to the Monitoring Workbook)
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### Step 2: Calculation of $EA_y$

$$EA_y = \sum_i CA_{i,y} * w_{SF6,i}$$

Where:

$CA_{i,y}$  = Cylinder minimum for cylinder  $i$  in year  $y$ , tonnes gas  
 $w_{SF6,i}$  = Concentration of SF<sub>6</sub> in the cylinder  $i$ , tonnes SF<sub>6</sub>/tonnes gas

$$CA_{i,y} = MIN\{MR_{Gas,i,y}, MS_{Gas,i,y}, MI_{Gas,i,y}\}$$

Where:

$MR_{Gas,i,y}$  = Mass of used gas recovered into cylinder  $i$  at the SF<sub>6</sub> recovery site in year  $y$   
 $MS_{Gas,i,y}$  = Mass of used gas stored in recovery cylinder  $i$  in year  $y$ , tonnes gas  
 $MI_{Gas,i,y}$  = Mass of used gas from cylinder  $i$  which is injected for reclamation process in year  $y$ , tonnes gas

### Results:

$i$	$MR_{Gas}$ (kg)	$MS_{Gas}$ (kg)	$MI_{Gas}$ (kg)	Concentration of SF <sub>6</sub>	$CA_{i,y}$ (kg)	$EA_i$ (tonne)
CDM-11003	1024.61	1020.00	970.40	99.53%	970.40	0.97
CDM-11004	1097.67	1080.00	959.54	97.18%	959.54	0.93
CDM-11005	1074.38	973.50	930.97	99.62%	930.97	0.93
				Sum (CDM-11003~11005)	2860.90	2.83
CDM-11006	1106.85	1058.50	1016.15	98.27%	1016.15	1.00
CDM-11007	1059.30	1014.00	977.34	99.22%	977.34	0.97
CDM-12001	1176.44	1179.00	1148.66	99.58%	1148.66	1.14
Sum	6539.25	6325.00	6003.04	Sum (CDM-11006~12001)	3142.15	3.11

Note: please refer to D.2 and the Monitoring Workbook.

### Step 3: Calculation of $DFT_y$

$$DFT_y = \frac{\sum_k (Q_{SF6,k,y} * RT_{k,y})}{Q_{SF6,y}}$$

Where:

$$Q_{SF6,k,y} = \sum_j Q_{SF6,k,j,y}$$

$$Q_{SF6,y} = \sum_k Q_{SF6,k,y}$$

Where:

$DFT_y$  = Discount factor for testing in year  $y$   
 $Q_{SF6,k,y}$  = Total amount of SF<sub>6</sub> filled in the testing of equipments in category  $k$  in year  $y$ , tonnes SF<sub>6</sub>  
 $Q_{SF6,y}$  = Total amount of SF<sub>6</sub> filled in testing of all equipments in the project activity in year  $y$ , tonnes SF<sub>6</sub>



$RT_{k,y}$	=	Ratio of number of eligible testing items in category $k$ (maximum value is set at 1)
$Q_{SF6,k,j,y}$	=	Amount of SF <sub>6</sub> that is filled into equipment $j$ of category $k$ in year $y$ at the SF <sub>6</sub> recovery site, tonnes SF <sub>6</sub>

	Parameter	Value	Reference
CDM-11003	$Q_{SF6,1,y}$	-	Measured
CDM-11004	$RT_{1,y}$	1.00	Calculated
CDM-11005	$Q_{SF6,2,y}$	-	Measured
(CDM-11003~CDM-11005)	$RT_{2,y}$	0.60	Calculated
	$DFT_y$	0.60	Calculated
CDM-11006	$Q_{SF6,1,y}$	3.12	Measured
CDM-11007	$RT_{1,y}$	1.00	Calculated
CDM-12001	$Q_{SF6,2,y}$	1.10	Measured
(CDM-11006~CDM12001)	$RT_{2,y}$	0.71	Calculated
	$Q_{SF6,y}$	4.22	Measured
	$DFT_y$	0.93	Calculated

Note: As the data of  $Q_{SF6,k,y}$  was not available for the cylinder bundle CDM-11003, CDM-11004 and CDM-11005, the value of  $RT_{2,y}$  is adopted as the value of  $DFT_y$ . This is considered as conservative. Please refer to B.2.1 for more detailed analysis. During the monitoring period, the equipments ranging from 12 to 800 KV were tested so the range is set at 12 KV to 800 KV and the categories are: 12 to 405 KV and 406 to 800 KV, so  $Q_{SF6,1,y}$  represents the total amount of SF<sub>6</sub> filled in the testing of equipments in category 1 (12 to 405KV) in year  $y$  and  $Q_{SF6,2,y}$  represents the total amount of SF<sub>6</sub> filled in the testing of equipments in category 2 (406 to 800 KV) in year  $y$ .

$RT_{k,y}$ :

$$RT_{k,y} = \frac{NT_{BL,k}}{NT_{PJ,k,y}}$$

Where:

$RT_{k,y}$	=	Ratio of number of eligible testing items in category $k$ (maximum value is set at 1)
$NT_{BL,k}$	=	Average number of eligible testing items where venting occurred per equipment in the baseline, for category $k$
$NT_{PJ,k,y}$	=	Average number of total testing items where recovery was done per equipment in the project, for category $k$

Results:

	Parameter	Value	Reference
CDM-11003 CDM-11004 CDM-11005 (CDM-11003~CDM-11005)	$NT_{BL,1}$	2.76	The registered PDD
	$NT_{BL,2}$	1.90	The registered PDD
	$NT_{PJ,1,y}$	2.26	Calculated (refer to the Monitoring Workbook)
	$NT_{PJ,2,y}$	3.14	Calculated (refer to the Monitoring Workbook)
	$RT_{1,y}$	1.00	Calculated
	$RT_{2,y}$	0.60	Calculated
CDM-11006	$NT_{BL,1}$	2.76	The registered PDD
CDM-11007	$NT_{BL,2}$	1.90	The registered PDD

CDM-11006 (CDM-11006~CDM12001)	$NT_{PJ,1,y}$	2.05	Calculated (refer to the Monitoring Workbook)
	$NT_{PJ,2,y}$	2.67	Calculated (refer to the Monitoring Workbook)
	$RT_{1,y}$	1.00	Calculated
	$RT_{2,y}$	0.71	Calculated

#### $NT_{PJ,k,y}$ :

The average number of total testing items where recovery was done per equipment in the project in category k in the year y, ( $NT_{PJ,k,y}$ ) are derived by using the testing records from the project year.

In the registered PDD, it states that the equipments ranging from 40 KV to 800 KV were tested in the historic baseline period, and two categories were formed: 40 to 419 KV and 420 KV to 800 kV.  $NT_{BL,1}$  and  $NT_{BL,2}$  were calculated based on the historical records in the registered PDD.

During the monitoring period, the equipments ranging from 12 to 800 KV were tested so the range is set at 12 KV to 800 KV and the categories are: 12 to 405 KV and 406 to 800 KV.

$NT_{PJ,k,y}$  results for CDM-11003~CDM-11005:

Category	Number of tested equipment	Number of testing items where recovery was done in year y	Average number per equipment in year y $NT_{PJ,k,y}$
Category 1 (12 KV~ 405 KV)	47	106	2.26
Category 2 (406 KV~ 800KV)	7	22	3.14

Note: “Number of tested equipment” and “Number of testing items where recovery was done in year y” were counted in sheet “KERI data” in the Monitoring Workbook.

$NT_{PJ,k,y}$  results for CDM-11006~ CDM-12001:

Category	Number of tested equipment	Number of testing items where recovery was done in year y	Average number per equipment in year y $NT_{PJ,k,y}$
Category 1 (12 KV~ 405 KV)	38	78	2.05
Category 2 (406 KV~ 800KV)	15	40	2.67

Note: “Number of tested equipment” and “Number of testing items where recovery was done in year y” were counted in sheet “KERI data” in the Monitoring Workbook.

## E.2. Calculation of project emissions or actual net GHG removals by sinks

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$PE_y = PE_{RCL,y} + PE_{TF,y} + PE_{RF,y} + PE_{EXC,y}$	
Where:	
$PE_y$	= Project emissions in year y, tCO <sub>2</sub> e
$PE_{RCL,y}$	= Project emissions from emission of SF <sub>6</sub> during reclamation in year y, tCO <sub>2</sub> e
$PE_{TF,y}$	= Project emissions as a result of increased electricity consumption at the testing facility attributable to project activity in year y, tCO <sub>2</sub> e
$PE_{RF,y}$	= Project emissions as a result of increased electricity consumption at the reclamation facility attributable to project activity in year y, tCO <sub>2</sub> e
$PE_{EXC,y}$	= Project emissions from exceptional event(s) at the SF <sub>6</sub> reclamation site in year y, tCO <sub>2</sub> e

**Results:**

Parameter	Value	Reference
$PE_{RCL,y}$	1,952.14	Calculated
$PE_{TF,y}$	6.64	Calculated
$PE_{RF,y}$	0.08	Calculated
$PE_{EXC,y}$	2.06	Calculated
$PE_y$	1,961	Calculated

 **$PE_{RCL,y}$ :**

$$PE_{RCL,y} = GWP_{SF6} \cdot \sum_{j,i} (R_{SF6,y,j,i} - R_{SF6,hist,j}) \cdot P_{SF6,y,i}$$

**Where**

- $PE_{RCL,y}$  = Project emissions from the emission of SF<sub>6</sub> during reclamation in the year y, tCO<sub>2</sub>e  
 $GWP_{SF6}$  = Global warming potential of SF<sub>6</sub>, tCO<sub>2</sub>e/t SF<sub>6</sub>  
 $R_{SF6,y,j,i}$  = Rate of SF<sub>6</sub> loss from point j during the reclamation period of cylinder i, in year y, %  
 $R_{SF6,hist,j}$  = Historical rate of SF<sub>6</sub> loss from point j, %  
 $P_{SF6,y,i}$  = Production of SF<sub>6</sub> during reclamation period of cylinder i in year y, t SF<sub>6</sub>

**Results:**

Parameter	Value	Reference
$GWP_{SF6}$	23,900	default
$R_{SF6,hist,j}$	0.058%	The registered PDD
$i$	$R_{SF6,y,i,i}$	$P_{SF6,y,i}$ (kg)
CDM-11003	0.140%	45,107
CDM-11004	0.078%	46,656
CDM-11005	0.143%	35,930
CDM-11006	0.054%	32,523
CDM-11007	0.051%	42,488
CDM-12001	0.073%	29,754
$PE_{RCL,y}$	1,952.14	Calculated

 **$PE_{TF,y}$ :**

Rated capacity of the operating equipment: project operating equipment at the Testing Facility comprises two Compressors – 10kW; Suctioning Pump – 0.6 kW; Vacuum Pump – 1.5kW; and Evaporator –4.8kW, 16.9 kW in total.

The “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” is applied and  $EC_{PJ,j,y}$  is approximated by the rated capacity of the operating equipment multiplied by operating hours of the facility, as permitted by AM0079 version 2.

$$PE_{TF,y} = \sum_j EC_{PJ,j,y} * EF_{EL,j,y} (1 + TDL_{j,y})$$

Parameter	Value	Reference
Rated capacity of all equipment (MW)	0.0169	MW
Operating hours	252.04	Measured
$EF_{EL,i,y}$ (tCO <sub>2</sub> e/MWh)	1.3	The registered PDD
$TDL_{j,y}$	20%	The registered PDD
$PE_{TF,y}$	6.64	Calculated
$j$	Testing facility	-

Note: the maximum number of the operation hours of the equipments at the recovery site was adopted, which is 252.04 hours.

### $PE_{RF,y}$ :

Rated capacity of the operating equipment: project operating equipment added at the Reclamation Facility comprises one mass flow meter – 6 W.

Operating hours: Conservatively estimated as 8760 hr/yr.

$$PE_{RF,y} = \sum_j EC_{PJ,j,y} * EF_{EL,j,y} (1 + TDL_{j,y})$$

Parameter	Value	Reference
Rated capacity of all equipment (MW)	0.000006	MW
Operating hours	8760	Estimated
$EF_{EL,j,y}$ (tCO <sub>2</sub> e/MWh)	1.3	The registered PDD
$TDL_{j,y}$	20%	The registered PDD
$PE_{RF,y}$	0.08	Calculated
$j$	Reclamation facility	-

### $PE_{EXC,y}$ :

$EXC_{SF6,y}$  is considered when an exceptional event occurred at the SF<sub>6</sub> reclamation site, for example an accident or emergency plant shutdown leading to the emission of SF<sub>6</sub> injected for reclamation.

The SF<sub>6</sub> quantity ( $EXC_{SF6,y}$ ) from any reclamation that coincides with the event is considered as project emissions ( $PE_{EXC,y}$ ). If a recovery cylinder of used gas was being reclaimed when the event occurred, then the amount of gas extracted from the cylinder between 5 hours prior to the exceptional event and the time that the injection line was closed is considered as  $EXC_{SF6,y}$ .

$$PE_{EXC,y} = GWP_{SF6} \cdot EXC_{SF6,y} \quad (1)$$

Where

- $PE_{EXC,y}$  = Project emissions from exceptional event(s) at the SF<sub>6</sub> reclamation site in year y, tCO<sub>2</sub>e
- $GWP_{SF6}$  = Global warming potential of SF<sub>6</sub>, t CO<sub>2</sub>e/t SF<sub>6</sub>
- $EXC_{SF6,y}$  = Quantity of SF<sub>6</sub> which was being injected to the reclamation facility during exceptional events occurred in year y, tonnes SF<sub>6</sub>

Parameter	Value	Reference
$GWP_{SF6}$	23,900	default
$EXC_{SF6,y}$ (kg)	0.086	Measured
$PE_{EXC,y}$	2.06	Calculated

### E.3. Calculation of leakage

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According to the registered PDD, the leakage emissions associated with the Project are considered to be very marginal as to be negligible compared to the range of uncertainty of the GWP estimate, and they can be ignored during the crediting period.

Therefore, LE<sub>y</sub> = 0.

### E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO <sub>2</sub> e)
Total	109,647	1,961	0	107,686

**E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD**

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO <sub>2</sub> e)	177,304	107,686

Note: The ex-ante estimation value is an average value calculated based on registered PDD. The monitoring period covers 392 days, and the annual estimated CERs are 165,092 tCO<sub>2</sub>e in the registered PDD, so the average one is calculated as follows:  $165,092 / 365 * 392 = 177,304$ .

**E.6. Remarks on difference from estimated value in registered PDD**

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The achieved emission reductions were affected by 2 main factors. One factor is the using of deviation to methodology, which made the DFT (for cylinder bundle CDM-11003~CDM-11005) smaller and the emission reductions smaller accordingly. The other reason is that PDD was made several years ago and meanwhile, with technical development of GIS manufacturing, manufacturer can make circuit breakers (which is big part of GIS) smaller than the ones in the past, so the SF<sub>6</sub> gas demanding amount per each GIS being tested decreases.

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**History of the document**

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Form <b>Business Function:</b> Issuance		