Monitoring report form for CDM project activity
(Version 08.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT			
Title of the project activity	SF6 recovery and reclamation project, South Korea		
UNFCCC reference number of the project activity	4274		
Version number of the PDD applicable to this monitoring report	PDD Version 8, 26/02/2013		
Version number of this monitoring report	2		
Completion date of this monitoring report	09/06/2021		
Monitoring period number	8		
Duration of this monitoring period	13/02/2020~31/03/2021		
Monitoring report number for this monitoring period	na		
Project participants	Fluorine Korea Co. Ltd Solvay Energy Services SAS		
Host Party	Republic of Korea		
Applied methodologies and standardized baselines	11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride		
Sectoral scopes	AM0079 version 2, “Recovery of SF6 from Gas insulated electrical equipment in testing facilities”		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0	123,245	32,934
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	186,803 tCO2e		

SECTION A. Description of project activity

A.1. General description of project activity

>>

Purpose of the project activity:

The project activity aims to reduce SF_6 emissions 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_6 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_6 manufacturing facility located in Ulsan, South Korea.

General description of the project activity:

Under the project activity, used SF_6 is recovered using a compressor and a piping system and stored in pressurised dedicated recovery cylinders at KERI site. These cylinders are then transported to a SF_6 manufacturing facility, Fluorine Korea Co. Ltd. At Fluorine Korea Co. Ltd, chemical analysis is used to evaluate the moisture, gaseous and solid decomposition of the recovered gas. After checking that used SF_6 gas fulfils specifications for reclamation, the used SF_6 gas is fed into the new SF_6 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_6 in order to be sold in the market.

A.2. Location of project activity

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Fluorine Korea Co. Ltd: 383, Daejung-Ri, Onsan-Eup, Ulju-kun, Ulsan, Republic of Korea
Coordinates: Latitude 35.426374 Longitude 129.340193
Korea Electrotechnology Research Institute: 28-1 Seongju-dong, Changwon-si, Gyeongsangnamdo, Republic of Korea
Coordinates: Latitude 35.189363 Longitude 128.718224

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Fluorine Korea Co. Ltd	No
France	Solvay Energy Services SAS (Private entity)	No

A.4. References to applied methodologies and standardized baselines

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AM0079 "Recovery of SF_6 from Gas insulated electrical equipment in testing facilities" (version 2)
Reference:
https://cdm.unfccc.int/methodologies/DB/42SEZ8MUM8DFNLCXHJNOPKOPLONUTN"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01)
Reference: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view
Standard for application of the global warming potentials to Clean Development Mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol (version 01)
Reference: https://cdm.unfccc.int/faq/Reference/Standards/meth/reg_stan02.pdf

A.5. Crediting period type and duration

>>
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 project activity

>>
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_6 recovery site (KERI) and the other is the SF_6 reclamation site (SKF). 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 for this monitoring period

	SF_6 Recovery at KERI site		SF_6 Reclamation at SFK site	
I	Recovery Period from	Recovery Period to	Reclamation Period from	Reclamation Period to
CDM-20001	16 Jan 2020	11 Feb 2020	13 Feb 2020	22 Feb 2020
CDM-20002	11 Feb 2020	05 Mar 2020	12 Mar 2020	22 Mar 2020
CDM-20003	05 Mar 2020	03 Apr 2020	09 Apr 2020	16 Apr 2020
CDM-20004	03 Apr 2020	29 May 2020	04 Jun 2020	12 Jun 2020
CDM-20005	29 May 2020	09 Jul 2020	11 Jul 2020	17 Jul 2020
CDM-20006	09 Jul 2020	16 Jul 2020	04 Aug 2020	05 Aug 2020
CDM-20007	16 Jul 2020	28 Aug 2020	08 Sep 2020	16 Sep 2020
CDM-20008	28 Aug 2020	29 Oct 2020	02 Nov 2020	13 Nov 2020
CDM-20009	29 Oct 2020	11 Dec 2020	16 Dec 2020	25 Dec 2020
CDM-20010	11 Dec 2020	22 Jan 2021	08 Feb 2021	17 Feb 2021
CDM-21001	22 Jan 2021	17 Mar 2021	20 Mar 2021	28 Mar 2021

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

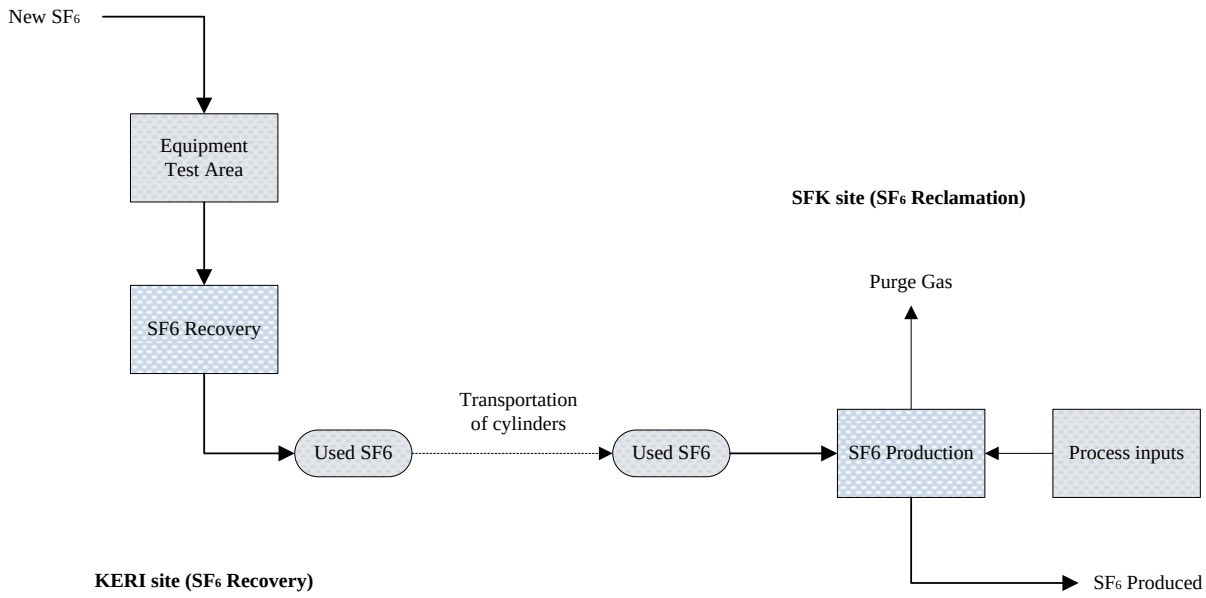

Fig B.1 Diagram of the recovery & reclamation process and the monitoring points

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

>>
Not applicable for this monitoring period

B.2.2. Corrections

>>
There is a correction that have been approved by the Board as applicable from the period prior to this monitoring period, PRC-4274-001, approved 27/08/2013.
The correction: In PDD version 8, Sub-step 3 (a), the ranges of the category k have been changed from 40-419 kV and 420- 800kV to 12-405 kV and 406-800 kV.

B.2.3. Changes to the start date of the crediting period

>>
Not applicable for this monitoring period

B.2.4. Inclusion of monitoring plan

>>
Not applicable for this monitoring period

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

>>
Not applicable for this monitoring period

B.2.6. Changes to project design

>>
Not applicable for this monitoring period

B.2.7. Changes specific to afforestation or reforestation project activity

>>

Not applicable for this monitoring period

SECTION C. Description of monitoring system

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

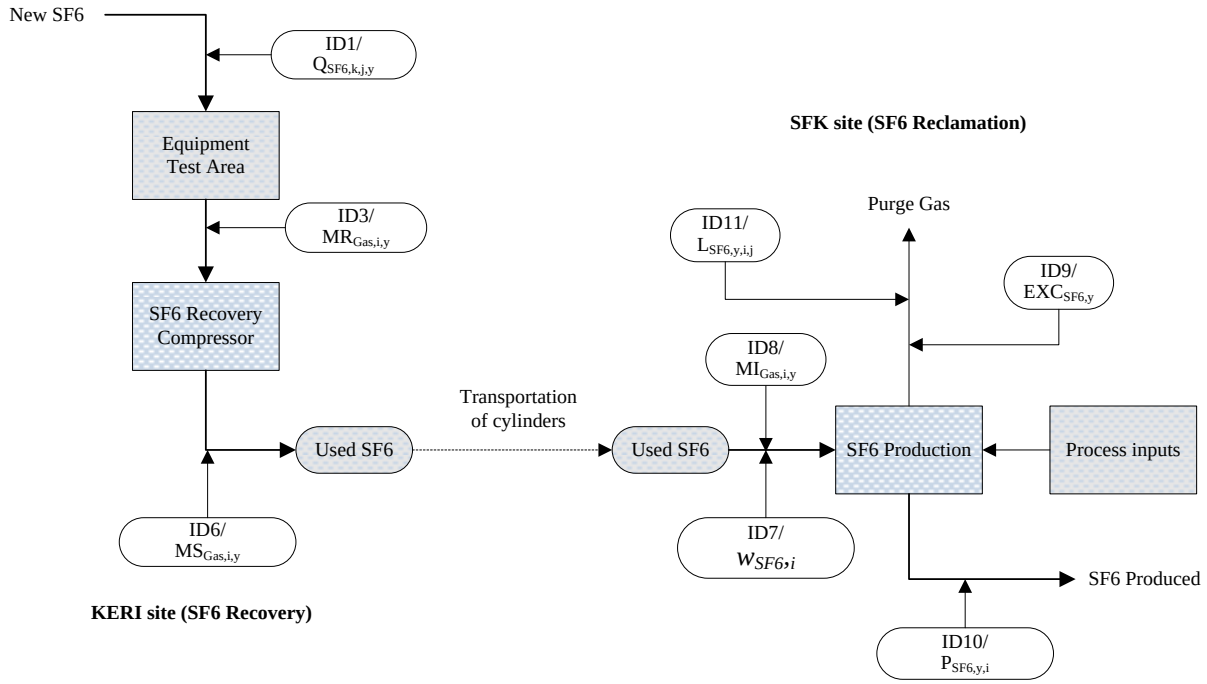


Fig C1. Diagram of the monitoring system

Project Monitoring Plan

Number	Code	Description	Purpose / Use	Location
1	$Q_{SF6,k,j,y}$	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	$w_{SF6,i}$	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	$EXC_{SF6,y}$	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	$P_{SF6,i,y}$	Production of SF_6 during the reclamation period of cylinder *i*, in year *y*	Project Emissions	SF_6 reclamation site
11	$L_{SF6,y,i,j}$	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 who are involved in the data collection process have defined roles and responsibilities. The overall monitoring responsibility for both the SFK and KERI sites is with the CDM coordinator of the SF_6 reclamation site (SFK). The standard operation procedures (SOP) were developed for the project and were in place at both recovery and reclamation sites. All the

personnel involved in the CDM activity were properly trained for both the normal project operation and CDM specific activities. CDM training records and SOP training records were both properly retained.

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_6 recovery site. The scale has been appropriately calibrated.
(ii) Mass flow meter: Flow meters are used to quantify the amount of SF_6 both at the SF_6 recovery and reclamation sites. The flow meters have been appropriately calibrated.
(iii) Gas chromatograph: The SF_6 content of the used gas in each cylinder bundle is analysed using a gas chromatography. The equipment has been appropriately calibrated.
Two cylinders filled with used SF_6 as one cylinder bundle are transported to the reclamation site with each cylinder bundle clearly identified and marked. Upon arrival at the SF_6 reclamation site, each cylinder bundle would be analysed, to determine the proportion of SF_6 gas and the proportion of impurities.

3. Data and records management

Data monitored for CDM purposes would be recorded and filed electronically once the cylinder bundle is filled with SF_6. All relevant data are 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 would be backed up. The CDM Coordinators are responsible for checking the data quality and are 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. Standard Operation 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

Data/Parameter	**$GWPSF_6$**
Unit	tCO_2e/tSF_6
Description	Global warming potential of SF_6
Source of data	IPCC Fourth Assessment Report;
Value(s) applied	22,800 for the second commitment period of the Kyoto Protocol 22,800 (provisional) for the 3rd commitment period of the Kyoto Protocol (for all emission reductions achieved from Jan 1st 2021); will be updated depending the CMP 16 guidance.
Choice of data or measurement methods and procedures	The value is adopted from IPCC Fourth Assessment Report, in the column "global warming potentials provided for given time horizon" using the 100-year time horizon.
Purpose of data/parameter	Baseline emissions calculation
Additional comments	Shall be updated according to any future COP/MOP decisions

Data/Parameter	**-**
Unit	MW
Description	Rated capacity of the operating equipment used for project activity of the testing facilities at recovery site and reclamation site in year y
Source of data	Records at recovery and reclamation sites
Value(s) applied	At recovery site = 0.0169 MW corresponds to total capacity of following corresponding equipments, 1. Two Compressors – 10kW 2. Suctioning Pump – 0.6 kW 3. Vacuum Pump – 1.5kW 4. Evaporator – 4.8kW Total: 16.9kW = 0.0169MW At reclamation site = 0.000006 MW, corresponds to the following equipment, 1. One flow meter – 6 W
Choice of data or measurement methods and procedures	Records at recovery and reclamation sites
Purpose of data/parameter	Project emissions calculation
Additional comments	The specification of the above monitoring instruments will be checked

Data/Parameter	**$EF_{elec,j,y}$**
Unit	tCO_2e/MWh
Description	Emissions factor for electricity consumed by process “j” in year “y”
Source of data	The registered PDD
Value(s) applied	1.30
Choice of data or measurement methods and procedures	Determined in the registered PDD. According to the registered PDD, emission factor of grid electricity in Korea was around $0.56tCO_2e/MWh$ when the registered PDD was developed. Hence, 1.3 was considered to be a conservative assumption. Value to be fixed during all the crediting period
Purpose of data/parameter	Project emissions calculation
Additional comments	As per the description in the registered PDD, the emission factor of grid electricity in Korea was around 0.56 tCO_2e/MWh. Hence, 1.3 is considered to be a conservative assumption Value to be fixed during all the crediting period

Data/Parameter	**$TDL_{j,y}$**
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j year y
Source of data	The registered PDD, and the adopted value is in line with “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
Value(s) applied	20%
Choice of data or measurement methods and procedures	Default value of “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 01) is applied.
Purpose of data/parameter	Project emissions calculation
Additional comments	-

Data/Parameter	**$TI_{SF6,used,t}$**
Unit	tonnes gas

Description	Used gas vented during eligible testing item for the historical baseline year
Source of data	The registered PDD
Value(s) applied	6.9452
Choice of data or measurement methods and procedures	Testing records of calendar year 2007 was used to determine the parameter in the registered PDD by using Method 2: Reconstruction based on Manufacturer Specification/Nameplate or estimated equipment capacity and procedures described in Annex A of the methodology and also all "CDM Records" as required by the procedure. Please refer to Annex 3 of the registered PDD for more detailed records.
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**k**
Unit	Dimensionless
Description	Sub-index used for equipment categories
Source of data	The registered PDD
Value(s) applied	Two categories: i) 12-405 kV and ii) 406-800 kV
Choice of data or measurement methods and procedures	Equipment is assigned to a category according to historical testing records of the equipment voltage rating, for the year 2007.
Purpose of data/parameter	Sub-index used for equipment categories
Additional comments	-

Data/Parameter	**$NT_{BL,k}$**
Unit	-
Description	Average number of eligible testing items where venting occurred per equipment in the baseline, for category k
Source of data	The registered PDD
Value(s) applied	For k category 12 - 405kV, $NT_{BL,1}$: 2.76 For k category 406 - 800 kV, $NT_{BL,2}$: 1.90
Choice of data or measurement methods and procedures	Determined in the registered PDD
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**$L_{SF6,hist,j}$**
Unit	tonnes SF_6
Description	Historical amount of SF_6 loss from point j, tonnes SF_6
Source of data	The registered PDD and it's estimated according to the records of the SF_6 reclamation site
Value(s) applied	0.434
Choice of data or measurement methods and procedures	Determined in the registered PDD
Purpose of data/parameter	Project emissions calculation
Additional comments	-

Data/Parameter	**j**
Unit	-

Description	Sub-index used for SF6 emission points
Source of data	Technical documents in the SF6 reclamation site
Value(s) applied	One SF6 emission point: purge gas outlet
Choice of data or measurement methods and procedures	Demonstrated from SF6 plant process diagram
Purpose of data/parameter	Sub-index used for SF6 emission points
Additional comments	-

Data/Parameter	**$P_{SF6,hist}$**
Unit	tonnes SF_6
Description	Production of SF_6 during the historical period, tonnes SF_6
Source of data	The registered PDD and it's estimated according to the records of the SF_6 reclamation site
Value(s) applied	748.608
Choice of data or measurement methods and procedures	Determined in the registered PDD
Purpose of data/parameter	Project emissions calculation
Additional comments	-

D.2. Data and parameters monitored

Data/Parameter	**GWP_{SF6}**
Unit	tCO_2e/tSF_6
Description	Global warming potential of SF_6
Measured/calculated/ default	Default
Source of data	IPCC Fourth Assessment Report;
Value(s) of monitored parameter	22,800 for the second commitment period of the Kyoto Protocol (for all emission reductions achieved from Jan 1st 2013 before Jan 1st 2021); 22,800 (provisional) for the 3rd commitment period of the Kyoto Protocol (for all emission reductions achieved from Jan 1st 2021); will be updated depending the CMP 16 guidance.
Monitoring equipment	-
Measuring/reading/recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**$w_{SF6,BL,hist,y}$**
Unit	tonnes SF_6/ tonnes gas
Description	Concentration of SF_6 in used gas in the baseline, to be used as a substitute for $w_{SF6,hist}$ where the record of the concentration of SF_6 in the gas vented in the baseline is not available
Measured/calculated/ default	Measured and calculated The 50% of cylinder bundles that represent the most conservative measurements are used to the parameter definition.

Source of data	Laboratory test results
Value(s) of monitored parameter	<table><tr><th>i</th><th>Value</th></tr><tr><td>CDM-20001</td><td>94.12%</td></tr><tr><td>CDM-20002</td><td>97.49%</td></tr><tr><td>CDM-20003</td><td>94.73%</td></tr><tr><td>CDM-20004</td><td>98.16%</td></tr><tr><td>CDM-20005</td><td>98.99%</td></tr><tr><td>CDM-20006</td><td>97.78%</td></tr><tr><td>CDM-20007</td><td>97.56%</td></tr><tr><td>CDM-20008</td><td>97.92%</td></tr><tr><td>CDM-20009</td><td>97.47%</td></tr><tr><td>CDM-20010</td><td>98.55%</td></tr><tr><td>CDM-21001</td><td>99.61%</td></tr><tr><td>$w_{SF6,BL,hist,y}$</td><td>96.27%</td></tr></table> Note: only the data of 5 cylinder bundles of lower SF_6 concentration (out of 11 cylinder bundles) is used for calculation for conservative reason.
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>The detection limit of all the gases analysed is at least 50 ppm.</td></tr><tr><td>Calibration Agency</td><td>SFK</td></tr><tr><td>Date of calibration</td><td>02 Oct 2019</td></tr><tr><td>Validity of calibration</td><td>2 years</td></tr></table>
Measuring/reading/recording frequency	The gas sample is collected every time a cylinder bundle arrives at SFK plant. This sample is analysed 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/parameter	Baseline emissions calculation
Additional comments	This variable does not exist in equations, however provided in monitoring table to be used as substitute to the variable $w_{SF6,hist}$

Data/Parameter	**$Q_{SF6,k,j,y}$**
Unit	tonnes SF_6
Description	Mass of SF_6 that is filled into equipment j of category k in the year y at the SF_6 recovery site
Measured/calculated/ default	Measured
Source of data	Records from the SF_6 recovery site
Value(s) of monitored parameter	$Q_{SF6,1}$: mass of SF6 that is filled into testing equipment of category 1 (12 to 405 KV) $Q_{SF6,2}$: mass of SF6 that is filled into testing equipment of category 2 (406 to 800 KV) $Q_{SF6,1}$= 8.73 t, $Q_{SF6,2}$ = 2.78 t;

Monitoring equipment	<table><tr><td>Monitoring equipment</td><td>Mass flow meter</td><td>Mass flow meter</td></tr><tr><td>Serial No.</td><td>14122007</td><td>14111339</td></tr><tr><td>Calibration frequency</td><td>5years, recommended by FMTech Co., Ltd</td><td>5years, recommended by FMTech Co., Ltd</td></tr><tr><td>Accuracy</td><td>±0.100%</td><td>±0.100%</td></tr><tr><td>Calibration Agency</td><td>FMTech Co., Ltd</td><td>FMTech Co., Ltd</td></tr><tr><td>Date of calibration</td><td>15 May 2017</td><td>15 May 2017</td></tr><tr><td>Validity of calibration</td><td>5 years</td><td>5 years</td></tr></table>
Measuring/reading/recording frequency	Measuring continuously and recording after each injection
Calculation method (if applicable)	-
QA/QC procedures	Meters subject to regular calibration according to standard FMT-QG-06
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**$MR_{Gas,i,y}$**
Unit	tonnes gas
Description	Mass of used SF_6 recovered into cylinder bundle i at the SF_6 recovery site in year y
Measured/calculated/ default	Measured
Source of data	Records from the SF_6 recovery site
Value(s) of monitored parameter	<table><tr><th>i</th><th>MR_{Gas} (kg)</th></tr><tr><td>CDM-20001</td><td>1071.90</td></tr><tr><td>CDM-20002</td><td>1070.90</td></tr><tr><td>CDM-20003</td><td>927.40</td></tr><tr><td>CDM-20004</td><td>988.20</td></tr><tr><td>CDM-20005</td><td>836.80</td></tr><tr><td>CDM-20006</td><td>111.20</td></tr><tr><td>CDM-20007</td><td>1061.40</td></tr><tr><td>CDM-20008</td><td>1129.40</td></tr><tr><td>CDM-20009</td><td>847.60</td></tr><tr><td>CDM-20010</td><td>985.80</td></tr><tr><td>CDM-21001</td><td>1051.70</td></tr><tr><td>Sum</td><td>10082.30</td></tr></table>
Monitoring equipment	<table><tr><td>Monitoring equipment</td><td>Mass flow meter</td></tr><tr><td>Serial No.</td><td>14069408</td></tr><tr><td>Calibration frequency</td><td>5years, recommended by FMTech Co., Ltd</td></tr><tr><td>Accuracy</td><td>±0.100%</td></tr><tr><td>Calibration Agency</td><td>FMTech Co., Ltd</td></tr><tr><td>Date of calibration</td><td>15 May 2017</td></tr><tr><td>Validity of calibration</td><td>5 years</td></tr></table>
Measuring/reading/recording frequency	Measuring continuously and recording after each recovery of the SF_6 being vented
Calculation method (if applicable)	-

QA/QC procedures	Meter subject to regular calibration according to standard FMT-QG-06
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**$MS_{Gas,i,y}$**
Unit	Tonnes of gas
Description	Mass of used gas stored in recovery cylinder bundle i in year y
Measured/calculated/ default	Measured
Source of data	Records from SF6 recovery site
Value(s) of monitored parameter	i: MS_{Gas} (kg) CDM-20001: 1027.50 CDM-20002: 1050.00 CDM-20003: 885.00 CDM-20004: 939.00 CDM-20005: 801.50 CDM-20006: 87.00 CDM-20007: 937.00 CDM-20008: 841.50 CDM-20009: 646.50 CDM-20010: 982.00 CDM-21001: 1047.50 Sum: 9244.50
Monitoring equipment	Monitoring equipment: Weighing Scale Serial No.: FR3 Calibration frequency: 2 years Accuracy: 0.5kg/5000kg Calibration Agency: Pyunghwa HiTech Date of calibration: 07 Nov 2017 31 Oct 2019 Validity of calibration: 2 years
Measuring/reading/recording frequency	Measuring and recording for each bundle of cylinders
Calculation method (if applicable)	-
QA/QC procedures	Meter subject to regular calibration according to standard KML-CAL-M05 and PH-I003
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	**$MI_{Gas,i,y}$**
Unit	Tonnes of gas
Description	Mass of used gas from the cylinder bundle i injected into the production process for reclamation process in year y
Measured/calculated/ default	Measured
Source of data	Records from SF_6 recovery site

Value(s) of monitored parameter	

i	MI_{Gas} (kg)
CDM-20001	950.00
CDM-20002	949.00
CDM-20003	795.00
CDM-20004	869.00
CDM-20005	748.00
CDM-20006	80.00
CDM-20007	827.00
CDM-20008	764.00
CDM-20009	530.00
CDM-20010	851.00
CDM-21001	920.00
Sum	8283.00

Monitoring equipment	

Monitoring equipment	Mass flow meter
Serial No.	14014422
Calibration frequency	5years, recommended by FMTech Co., Ltd
Accuracy	±0.100%
Calibration Agency	FMTech Co., Ltd
Date of calibration	16 May 2017
Validity of calibration	5 years

Measuring/reading/recording frequency	Measuring continuously and recording after each injection of the SF_6 into the SF_6 production line
Calculation method (if applicable)	-
QA/QC procedures	Meter subject to regular calibration according to standard FMT-QG-06
Purpose of data/parameter	Baseline emissions calculation
Additional comments	-

Data/Parameter	$\mathbf{L_{SF6,y,i,j}}$
Unit	Tonnes SF_6
Description	Amount of SF_6 loss from point j during the reclamation period of cylinder i in year y
Measured/calculated/ default	Measured and calculated The measurement period is the period in which cylinder i is connected for gas reclamation
Source of data	Records from SF_6 reclamation site

<table>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>i</th><th>$L_{SF6,y,i,j}$ (kg)</th></tr>
<tr><td>CDM-20001</td><td>79.0</td></tr>
<tr><td>CDM-20002</td><td>86.6</td></tr>
<tr><td>CDM-20003</td><td>60.2</td></tr>
<tr><td>CDM-20004</td><td>17.0</td></tr>
<tr><td>CDM-20005</td><td>13.1</td></tr>
<tr><td>CDM-20006</td><td>6.3</td></tr>
<tr><td>CDM-20007</td><td>32.8</td></tr>
<tr><td>CDM-20008</td><td>67.9</td></tr>
<tr><td>CDM-20009</td><td>65.5</td></tr>
<tr><td>CDM-20010</td><td>92.1</td></tr>
<tr><td>CDM-21001</td><td>67.6</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><th>Monitoring equipment</th><th>Mass flow meter</th></tr>
<tr><td>Serial No.</td><td>14014074</td></tr>
<tr><td>Calibration frequency</td><td>5years, recommended by FMTech Co., Ltd</td></tr>
<tr><td>Accuracy</td><td>±0.35%</td></tr>
<tr><td>Calibration Agency</td><td>FMTech Co., Ltd</td></tr>
<tr><td>Date of calibration</td><td>15 May 2017</td></tr>
<tr><td>Validity of calibration</td><td>5 years</td></tr>
</table>
<table>
<tr><th>Monitoring equipment</th><th>Gas Chromatograph</th></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>The detection limit of all the gases analysed is at least 50 ppm.</td></tr>
<tr><td>Calibration Agency</td><td>SFK</td></tr>
<tr><td rowspan="2">Date of calibration</td><td>13 Oct 2017</td></tr>
<tr><td>02 Oct 2019</td></tr>
<tr><td>Validity of calibration</td><td>2 years</td></tr>
</table>
</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Mass flow meter: Measuring continuously and recording daily
Gas Chromatograph: Measuring daily;</td></tr>
<tr><td>Calculation method (if applicable)</td><td>$L_{SF6,y,i,j}$ = Daily purge mass amount of gas × Volume% of SF_6</td></tr>
<tr><td>QA/QC procedures</td><td>Meter subject to regular calibration according to standard FMT-QG-06</td></tr>
<tr><td>Purpose of data/parameter</td><td>Project emissions reduction</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data/Parameter	**$P_{SF6,y,i}$**
Unit	Tonnes SF_6
Description	Production of SF_6 during the reclamation period of cylinder i, in year y
Measured/calculated/ default	Measured
Source of data	Records from regular production monitoring at SF_6 reclamation site

Value(s) of monitored parameter	<table><tr><th>i</th><th>$P_{SF6,y,i}$ (kg)</th></tr><tr><td>CDM-20001</td><td>35,266</td></tr><tr><td>CDM-20002</td><td>40,978</td></tr><tr><td>CDM-20003</td><td>23,144</td></tr><tr><td>CDM-20004</td><td>19,676</td></tr><tr><td>CDM-20005</td><td>19,622</td></tr><tr><td>CDM-20006</td><td>4,106</td></tr><tr><td>CDM-20007</td><td>20,757</td></tr><tr><td>CDM-20008</td><td>28,307</td></tr><tr><td>CDM-20009</td><td>32,511</td></tr><tr><td>CDM-20010</td><td>39,553</td></tr><tr><td>CDM-21001</td><td>34,559</td></tr></table>
Monitoring equipment	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_6 filling work. As SF_6 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.
Measuring/reading/recording frequency	Measured and recorded daily
Calculation method (if applicable)	-
QA/QC procedures	The measurement period is the period in which cylinder *i* is connected for gas reclamation, as measured in days. Production to be measured daily. 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: Level gauge : ±50mm Pressure gauge : ± 0.5% Temperature : ± 0.5 %
Purpose of data/parameter	Project emissions reduction
Additional comments	-

Data/Parameter	**$NT_{PJ,k,y}$**
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
Source of data	Records from the SF_6 recovery site

Value(s) of monitored parameter	<table><tr><th></th><th>$NT_{,PJ,i}$</th></tr><tr><td>$NT_{,PJ,1}$ (for category: 12~405 kV)</td><td>2.91</td></tr><tr><td>$NT_{,PJ,2}$ (for category: 406~800 kV)</td><td>2.22</td></tr></table>
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_6 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_6 recovery site. For each category k, make an average of the counts for equipment in that category to derive $NT_{PJ,k,y}$
QA/QC procedures	-
Purpose of data/parameter	Baseline emissions reduction
Additional comments	-

Data/Parameter	***i***
Unit	N/A
Description	Sub-index used for each cylinder bundle that completed a recovery-reclamation cycle included in the estimation of emissions avoided for the year y
Measured/calculated/ default	-
Source of data	Records from the SF_6 recovery site and SF_6 reclamation site
Value(s) of monitored parameter	The relation between the Sub-index “i” and the number of cylinder bundle “n” is illustrated below. <table><tr><th>i</th><th>n</th></tr><tr><td>CDM-20001</td><td>0001</td></tr><tr><td>CDM-20002</td><td>0004</td></tr><tr><td>CDM-20003</td><td>0001</td></tr><tr><td>CDM-20004</td><td>0004</td></tr><tr><td>CDM-20005</td><td>0001</td></tr><tr><td>CDM-20006</td><td>0004</td></tr><tr><td>CDM-20007</td><td>0002</td></tr><tr><td>CDM-20008</td><td>0001</td></tr><tr><td>CDM-20009</td><td>0002</td></tr><tr><td>CDM-20010</td><td>0001</td></tr><tr><td>CDM-21001</td><td>0002</td></tr></table>
Monitoring equipment	-
Measuring/reading/recording frequency	-
Calculation method (if applicable)	-

QA/QC procedures	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
Purpose of data/parameter	-
Additional comments	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

Data/Parameter	**n**
Unit	N/A
Description	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
Measured/calculated/ default	-
Source of data	Records from the SF_6 recovery site and SF_6 reclamation site
Value(s) of monitored parameter	The relation between the Sub-index "i" and the number of cylinder bundle "n" is illustrated below.

i	n
CDM-20001	0001
CDM-20002	0004
CDM-20003	0001
CDM-20004	0004
CDM-20005	0001
CDM-20006	0004
CDM-20007	0002
CDM-20008	0001
CDM-20009	0002
CDM-20010	0001
CDM-21001	0002

Monitoring equipment	-
Measuring/reading/recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	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.
Purpose of data/parameter	-
Additional comments	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

Data/Parameter	**$w_{SF6,i}$**
Unit	Tonnes SF_6/ tonnes gas

Description	Concentration of SF_6 in the cylinder bundle i
Measured/calculated/ default	Measured
Source of data	laboratory test result
Value(s) of monitored parameter	

i	Value
CDM-20001	94.12%
CDM-20002	97.49%
CDM-20003	94.73%
CDM-20004	98.16%
CDM-20005	98.99%
CDM-20006	97.78%
CDM-20007	97.56%
CDM-20008	97.92%
CDM-20009	97.47%
CDM-20010	98.55%
CDM-21001	99.61%

Monitoring equipment	

Monitoring equipment	Gas Chromatograph
Serial No.	CN10622030
Calibration frequency	2 years
Accuracy	The detection limit of all the gases analysed is at least 50 ppm.
Calibration Agency	SFK
Date of calibration	02 Oct 2019
Validity of calibration	2 years

Measuring/reading/recording frequency	The gas sample is collected every time a cylinder bundle arrives in SFK plant. This sample is analysed 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.
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/parameter	Baseline emissions calculation
Additional comments	Given that the recovery and reclamation process are batch processes, and that the concentration of SF_6 in the used gas remains constant after recovery and before reclamation, $w_{SF6,i}$ needs to be measured only once per cylinder bundle to determine the proportion of SF_6 in the gas contained in that cylinder bundle.

Data/Parameter	**$PE_{TF,y}$**
Unit	tCO_2e
Description	Project emissions as a result of increased electricity consumption at the testing facility attributable to project activity in year y
Measured/calculated/ default	Calculated
Source of data	Records from SF_6 testing facility
Value(s) of monitored parameter	261.32
Monitoring equipment	-
Measuring/reading/recording frequency	-

Calculation method (if applicable)	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 and "monitoring data & emission reduction estimation workbook".
QA/QC procedures	-
Purpose of data/parameter	Project emissions calculation
Additional comments	-

Data/Parameter	**$PE_{RF,y}$**
Unit	tCO_2e
Description	Project emissions as a result of increased electricity consumption at the reclamation facility attributable to project activity in year y
Measured/calculated/ default	Calculated
Source of data	Records from SF_6 reclamation facility
Value(s) of monitored parameter	0.09
Monitoring equipment	-
Measuring/reading/recording frequency	-
Calculation method (if applicable)	Electricity consumption approximated by the rated capacity of the operating equipment multiplied by operating hours of the equipment. Please refer to Section E.2 and "monitoring data & emission reduction estimation workbook".
QA/QC procedures	-
Purpose of data/parameter	Project emissions calculation
Additional comments	-

Data/Parameter	**$EXC_{SF6,y}$**
Unit	Tonnes SF_6
Description	Quantity of SF_6 which was being injected to the reclamation facility during exceptional events occurred in year y
Measured/calculated/ default	Measured
Source of data	Records from SF_6 reclamation facility
Value(s) of monitored parameter	

i	$EXC_{SF6,y}$ (kg)
CDM-20001	0.0
CDM-20002	19.0
CDM-20003	21.0
CDM-20004	0.0
CDM-20005	0.0
CDM-20006	0.0
CDM-20007	40.0
CDM-20008	5.0
CDM-20009	42.0
CDM-20010	23.0
CDM-21001	36.0
Sum	**186.0**

<table>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td>Monitoring equipment</td><td>Mass flow meter</td></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>±0.100%</td></tr>
<tr><td>Calibration Agency</td><td>FMTech Co., Ltd</td></tr>
<tr><td>Date of calibration</td><td>16 May 2017</td></tr>
<tr><td>Validity of calibration</td><td>5 years</td></tr>
</table>
</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>The project proponent records the date and time of any exceptional event that occurs in year y that results in the unusual emission of SF_6
The SF_6 quantity ($EXC_{SF6,y}$) from any reclamation that coincides with the event must be considered as project emissions ($PE_{EXC,y}$)
For example, if a cylinder bundle of used gas was being reclaimed when the event occurred, then the total amount of gas injected from the cylinder bundle into the reclamation line between 5 hours prior to the event and until the time that the injection line was shut off must be considered as $EXC_{SF6,y}$.
The total amount of gas is to be taken from the continuous measurement of the flow meter on the injection line used to determine $MI_{Gas,i.}$
The concentration of the SF_6 was considered as 100% for the calculation of $EXC_{SF6,y}$, and this is conservative.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>-</td></tr>
<tr><td>QA/QC procedures</td><td>-</td></tr>
<tr><td>Purpose of data/parameter</td><td>Project emissions calculation</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

D.3. Implementation of sampling plan

>>
Not applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>>
According to Standard for application of the global warming potentials to Clean Development Mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol (version 01), for emission reductions achieved starting from 1 January 2013 to 31 December 2020, the global warming potentials of SF6 (GWP_{SF6}) 22,800 is used;
For the third commitment period of the Kyoto Protocol (for all emission reductions achieved from Jan 1st 2021), the provisional GWP_{SF6} of 22,800 is used for the emission reduction. This value will be updated depending the CMP 16 guidance.
Baseline emissions and project emissions are divided into two periods, one is before 1 Jan 2021, belonging to the second commitment period of the Kyoto Protocol, and the other is starting from Jan 1st 2021, belonging to the third commitment period of the Kyoto Protocol. Accordingly, the cylinder i (refers to each recovery-reclamation cycle) from CDM-20001 to CDM-20009 falls under the first period of this monitoring period, and cylinder i from CDM-20010 to CDM-20011 falls under the second period.

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_2e
DFT_y	=	Discount factor for testing in year *y*
EA_y	=	Quantity of SF_6 reclaimed during the year *y*, tonnes SF_6
$V_{SF6,hist}$	=	Historical annual baseline venting of SF_6, tonnes SF_6
GWP_{SF6}	=	Global warming potential of SF_6, tCO_2e/tonnes SF_6

Results:

Parameter	Unit	Value	Reference
DFT_y	-	0.92	Calculated
$EA_{y,before\ Jan\ 1\ 2021}$	t	6.32	Measured and calculated
$EA_{y,\ from\ Jan\ 1\ 2021}$	t	1.76	Measured and calculated
EA_y	t	8.07	Measured and calculated
$V_{SF6,hist,before\ Jan\ 1\ 2021}$	t	5.92	Calculated
$V_{SF6,hist,\ from\ Jan\ 1\ 2021}$	t	1.65	Calculated
$V_{SF6,hist}$	t	7.57	Calculated
$GWP_{SF6,before\ Jan\ 1\ 2021}$	-	22,800	default
$GWP_{SF6,from\ Jan\ 1\ 2021}$	-	22,800	provisional
$\boldsymbol{BE_{y,before\ Jan\ 1\ 2021}}$	t	123,245	Calculated
$\boldsymbol{BE_{y,from\ Jan\ 1\ 2021}}$	t	32,934	Calculated
$\boldsymbol{BE_y}$	t	156,236	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_6 expected in used gas in the historical period, tonnes SF_6/tonnes gas

Results:

Parameter	Value	Unit	Reference
$TI_{SF6,used}$	6.9452	t	The registered PDD
$\sum TI_{SF6,used}$	7.8585	t	Calculated (refer to the ER Workbook)
$w_{SF6,hist}$	96.27%	-	Measured and calculated (refer to D.2 and ER workbook)
$V_{SF6,hist}$	7.57	t	Calculated (refer to the ER Workbook)
$V_{SF6,hist,before\ Jan\ 1\ 2021}$	5.92	t	Calculated (refer to the ER Workbook)
$V_{SF6,hist,\ from\ Jan\ 1\ 2021}$	1.65	t	Calculated (refer to the ER Workbook)

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_6 in the cylinder i, tonnes SF_6/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_6 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)	$w_{SF6,i}$	$CA_{i,y}$ (kg)	EA_i (tonne)
CDM-20001	1071.90	1027.50	950.00	94.12%	950.00	0.89
CDM-20002	1070.90	1050.00	949.00	97.49%	949.00	0.93
CDM-20003	927.40	885.00	795.00	94.73%	795.00	0.75
CDM-20004	988.20	939.00	869.00	98.16%	869.00	0.85
CDM-20005	836.80	801.50	748.00	98.99%	748.00	0.74
CDM-20006	111.20	87.00	80.00	97.78%	80.00	0.08
CDM-20007	1061.40	937.00	827.00	97.56%	827.00	0.81
CDM-20008	1129.40	841.50	764.00	97.92%	764.00	0.75
CDM-20009	847.60	646.50	530.00	97.47%	530.00	0.52
CDM-20010	985.80	982.00	851.00	98.55%	851.00	0.84
CDM-21001	1051.70	1047.50	920.00	99.61%	920.00	0.92
$EA_{y,before\ Jan\ 1\ 2021}$ (from CDM-20001 to CDM-20009)						6.32
$EA_{y,\ from\ Jan\ 1\ 2021}$ (from CDM-2001- to CDM-21001)						1.76
EA_y						8.07

Note: please refer to D.2 and the ER Workbook for more detailed calculation.

Step 3: Calculation of DFT_y

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

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_6 filled in the testing of equipments in category k in year y, tonnes SF_6
$Q_{SF6,y}$ = Total amount of SF_6 filled in testing of all equipments in the project activity in year y, tonnes SF_6
$RT_{k,y}$ = Ratio of number of eligible testing items in category k (maximum value is set at 1)
$Q_{SF6,k,j,y}$ = Amount of SF_6 that is filled into equipment j of category k in year y at the SF_6 recovery site, tonnes SF_6

Parameter	Value	Unit	Reference
$Q_{SF6,1,y}$	8.73	t	Measured
$RT_{1,y}$	0.95	-	Calculated
$Q_{SF6,2,y}$	2.78	t	Measured
$RT_{2,y}$	0.86	-	Calculated
DFT_y	0.92	-	Calculated

$RT_{k,y}$:

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

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
$NT_{BL,1}$	*2.76*	The registered PDD
$NT_{BL,2}$	*1.90*	The registered PDD
$NT_{PJ,1,y}$	2.91	Calculated (refer to the ER Workbook)
$NT_{PJ,2,y}$	2.22	Calculated (refer to the ER Workbook)
$RT_{1,y}$	0.95	Calculated
$RT_{2,y}$	0.86	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.

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	137	2.91
Category 2 (406 KV~ 800KV)	9	20	2.22
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 ER Workbook.			

E.2. Calculation of project emissions or actual net removals

>>

$$PE_y = PE_{RCL,y} + PE_{TF,y} + PE_{RF,y} + PE_{EXC,y}$$

Where:

PE_y = Project emissions in year *y*, tCO_2e

$PE_{RCL,y}$ = Project emissions from emission of SF_6 during reclamation in year *y*, tCO_2e

$PE_{TF,y}$ = Project emissions as a result of increased electricity consumption at the testing facility attributable to project activity in year *y*, tCO_2e

$PE_{RF,y}$ = Project emissions as a result of increased electricity consumption at the reclamation facility attributable to project activity in year *y*, tCO_2e

$PE_{EXC,y}$ = Project emissions from exceptional event(s) at the SF_6 reclamation site in year *y*, tCO_2e

As explained in E.1, project emissions are divided into two periods too, representing project emissions achieved in the second commitment period and third commitment period.

Results:

Parameter	Value (t)	Reference
$PE_{RCL,y,before\ Jan\ 1\ 2021}$	6,800.70	Calculated
$PE_{RCL,y,after\ Jan\ 1\ 2021}$	2,662.93	Calculated
$PE_{RCL,y}$	9,463.63	Calculated
$PE_{TF,y,before\ Jan\ 1\ 2021}$	204.37	Calculated
$PE_{TF,y\ y,after\ Jan\ 1\ 2021}$	56.95	Calculated
$PE_{TF,y}$	261.32	Calculated
$PE_{RF,y,before\ Jan\ 1\ 2021}$	0.07	Calculated
$PE_{RF,y\ y,after\ Jan\ 1\ 2021}$	0.02	Calculated
$PE_{RF,y}$	0.09	Calculated

$PE_{EXC,y,before\ Jan\ 1\ 2021}$	2,895.60	Calculated
$PE_{EXC,y\ y,after\ Jan\ 1\ 2021}$	1,345.20	Calculated
$PE_{EXC,y}$	4,240.80	Calculated
$\boldsymbol{PE_{y,before\ Jan\ 1\ 2021}}$	9,901	Calculated
$\boldsymbol{PE_{y\ y,after\ Jan\ 1\ 2021}}$	4,065	Calculated
$\boldsymbol{PE_{y}}$	13,909	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_6 during reclamation in the year *y*, tCO_2e

GWP_{SF6} = Global warming potential of SF_6, $tCO_2e/t\ SF_6$

$R_{SF6,y,j,i}$ = Rate of SF_6 loss from point *j* during the reclamation period of cylinder *i*, in year *y*, %

$R_{SF6,hist,j}$ = Historical rate of SF_6 loss from point *j*, %

$P_{SF6,y,i}$ = Production of SF_6 during reclamation period of cylinder *i* in year *y*, t SF_6

Results:

Parameter	Value	Reference
$GWP_{SF6,before\ Jan\ 1\ 2021}$	22,800	default
$GWP_{SF6,from\ Jan\ 1\ 2021}$	22,800	provisional
$R_{SF6,hist,j}$	0.058%	The registered PDD

i	$R_{SF6,y,j,i}$	$P_{SF6,y,i}$ *(kg)*	Reference
CDM-20001	0.224%	35,266	Measured
CDM-20002	0.211%	40,978	Measured
CDM-20003	0.260%	23,144	Measured
CDM-20004	0.087%	19,676	Measured
CDM-20005	0.067%	19,622	Measured
CDM-20006	0.154%	4,106	Measured
CDM-20007	0.158%	20,757	Measured
CDM-20008	0.240%	28,307	Measured
CDM-20009	0.201%	32,511	Measured
CDM-20010	0.233%	39,553	Measured
CDM-21001	0.196%	34,559	Measured
$\boldsymbol{PE_{RCL,y,before\ Jan\ 1\ 2021}}$ **(t)**		6,800.70	Calculated
$\boldsymbol{PE_{RCL,y,from\ Jan\ 1\ 2021}}$ **(t)**		2,662.93	Calculated
$\boldsymbol{PE_{RCL,y}}$ **(t)**		9,463.63	Calculated

$$R_{SF6,hist,j} = \frac{L_{SF6,hist,j}}{P_{SF6,hist}}$$

Where:

$R_{SF6,hist,j}$ = Historical rate of SF_6 loss from point *j*, %

$L_{SF6,hist,j}$ = Historical amount of SF_6 loss from point *j*, tonnes SF_6

$P_{SF6,hist}$ = Production of SF_6 during the historical period, tonnes SF_6

j = Sub-index used for SF_6 emission points

$R_{SF6,hist,j}$ was determined in the registered PDD as 0.058%.

$$R_{SF6,y,j} = \sum_{i} \frac{L_{SF6,y,j,i}}{P_{SF6,y,i}}$$

Where:

$R_{SF6,y,j}$ = Rate of SF_6 loss from point *j* in year *y*, %
$L_{SF6,y,j,i}$ = Amount of SF_6 loss from point *j* during the reclamation period of cylinder *i* in year *y*, tonnes SF_6
$P_{SF6,y,i}$ = Production of SF_6 during the reclamation period of cylinder *i*, in year *y*, tonnes SF_6
j = Sub-index used for SF_6 emission points

i	$R_{SF6,y,j,i}$	$P_{SF6,y,i}$ (kg)/measured	$L_{SF6,hist,j}$ /measured
CDM-20001	0.224%	35,266	79.0
CDM-20002	0.211%	40,978	86.6
CDM-20003	0.260%	23,144	60.2
CDM-20004	0.087%	19,676	17.0
CDM-20005	0.067%	19,622	13.1
CDM-20006	0.154%	4,106	6.3
CDM-20007	0.158%	20,757	32.8
CDM-20008	0.240%	28,307	67.9
CDM-20009	0.201%	32,511	65.5
CDM-20010	0.233%	39,553	92.1
CDM-21001	0.196%	34,559	67.6

$PE_{TF,y}$:
Rated capacity of the operating equipment: project operating equipment at the Testing Facility comprises two Compressors – 10kW; Suctioning Pump – 0.6 kW; Vaccum 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	Nameplates and manufacturer's documents
Operating hours before Jan 1 2021	7,752	Conservatively estimated
Operatiing hours from Jan 1 2021	2,160	Conservatively estimated
$EF_{EL,j,y}$ (tCO_2e/MWh)	1.3	The registered PDD
$TDL_{j,y}$	20%	The registered PDD
J	Testing facility	-
$PE_{TF,y,before\ Jan\ 1\ 2021}$ (t)	204.37	Calculated
$PE_{TF,y,\ from\ Jan\ 1\ 2021}$ (t)	56.95	Calculated
$PE_{TF,y}$(t)	261.32	Calculated

$PE_{RF,y}$:
Rated capacity of the operating equipment: project operating equipment added at the Reclamation Facility comprises one mass flow meter – 6 W.

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

Parameter	Value	Reference
Rated capacity of all equipment (MW)	0.000006	MW
Operating hours before Jan 1 2021	7,752	Conservatively estimated
Operatiing hours from Jan 1 2021	2,160	Conservatively estimated
$EF_{EL,j,y}$ (tCO_2e/MWh)	1.3	The registered PDD
$TDL_{j,y}$	20%	The registered PDD
J	Reclamation facility	-
$PE_{RF,y,before\ Jan\ 1\ 2021}$ (t)	0.07	Calculated
$PE_{RF,y,\ from\ Jan\ 1\ 2021}$ (t)	0.02	Calculated
$PE_{RF,y}$(t)	0.09	Calculated

$PE_{EXC,y}$:

$EXC_{SF6,y}$ is considered when an exceptional event occurred at the SF_6 reclamation site, for example an accident or emergency plant shutdown leading to the emission of SF_6 injected for reclamation.

The SF_6 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 $EXC_{SF6,y}$.

$$PE_{EXC,y} = GWP_{SF6} \cdot EXC_{SF6,y}$$

Where

$PE_{EXC,y}$ = Project emissions from exceptional event(s) at the SF_6 reclamation site in year *y*, tCO_2e

GWP_{SF6} = Global warming potential of SF_6, t CO_2e/t SF_6

$EXC_{SF6,y}$ = Quantity of SF_6 which was being injected to the reclamation facility during exceptional events occurred in year *y*, tonnes SF_6

Parameter	Value	Reference
$GWP_{SF6,before\ Jan\ 1\ 2021}$	22,800	default
$GWP_{SF6,from\ Jan\ 1\ 2021}$	22,800	provisional
$EXC_{SF6,y,before\ Jan\ 1\ 2021}$ *(kg)*	127.00	Measured
$EXC_{SF6,y,from\ Jan\ 1\ 2021}$ *(kg)*	59.00	Measured
$PE_{EXC,y,before\ Jan\ 1\ 2021}$ **(t)**	2,895.60	Calculated
$PE_{EXC,y,from\ Jan\ 1\ 2021}$ **(t)**	1,345.20	Calculated
$PE_{EXC,y}$ **(t)**	4,240.80	Calculated

E.3. Calculation of leakage emissions

>>

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, $LE_y = 0$.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
Total	170,145	13,909	0	0	123,245	32,934	156,236

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
156,236	186,803

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

>>
The amount estimated ex ante in the registered PDD is 165,092 t CO_2e in one year (365 days).
For this monitoring period (413 days, 13/02/2020 - 31/03/2021), the amount estimated ex ante is calculated as follow: 165,092 t CO_2e*(413 days/365 days) = 186,803 t CO_2e

E.6. Remarks on increase in achieved emission reductions

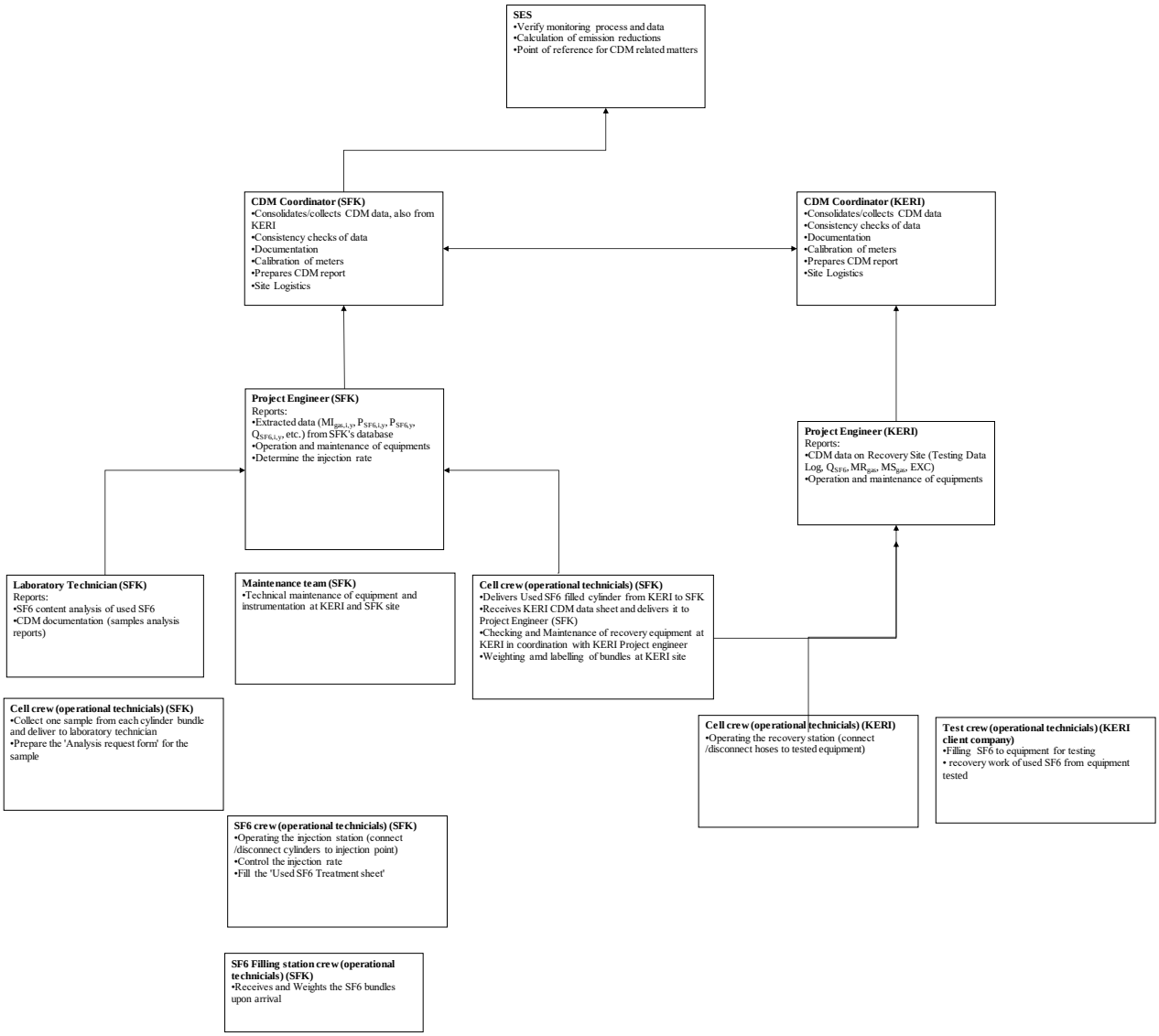
>>
The actual values achieved during this monitoring period are 156,236 tons, less than the values estimated in ex-ante calculation of registered PDD.

E.7. Remarks on scale of small-scale project activity

>>
Not applicable.

Appendix 1. Organizational structure of CDM monitoring

Organizational structure of CDM Monitoring at the South Korea SF6 Recovery and Reclamation Project



Document information

Version	*Date*	*Description*
08.0	6 April 2021	Revision to: • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).

Version	*Date*	*Description*
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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