CDM – Executive Board

CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason for revision
01	21 January 2003	• Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Bundled fossil fuel switching to NG (Natural Gas) project in Gyeonggi-do, Republic of Korea
Version: 3.3
Date: 27/09/2010

A.2. Description of the small-scale project activity:

This project (bundled fossil fuel switching in Gyeonggi-do) is organized by Samchully for reducing GHG emissions at three companies in the manufacturing industry. The three companies use bunker fuel oil C in baseline situation. Through this project, each company changes the fuel for their facility from bunker fuel oil C to NG. Each company is supplied with NG from Samchully. NG is a clean energy source for combustion. NG combustion has less GHG emission than bunker fuel oil C. In addition, NG results in less SOx and NOx.

Samchully supplies NG to Incheon Metropolitan City(Nam-gu, Jung-gu, Dong-gu, Yeonsu-gu and Namdong industrial complex) and Gyeonggi-do (Bucheon-si, Siheung-si, Gwangmyeong-si, Anyang-si Uiwang-si, Gunpo-si, Ansan-si, Yongin-si, Suwon-si, Hwaseong-si, Osan-si, Pyeongtaek-si, Anseong-si). Samchully is the largest NG service company in the Republic of Korea.

Regional Division	Service Area
Incheon	Incheon Metropolitan City(Nam-gu, Jung-gu, Dong-gu, Yeonsu-gu and Namdong industrial complex)
Seobu	Bucheon-si, Siheung-si, Ansan-si
Jungbu	Gwangmyeong-si, Anyang-si, Gunpo-si, Uiwang-si
Nambu	Suwon-si, Hwaseong-si, Osan-si, Pyeongtaek-si, Anseong-si, Yongin-si

The three companies that are switching bunker fuel oil C to NG are Youngjin Chemical Co., Ltd., Sammi Industrial Co., Ltd., and Asia Stabilizers Co., Ltd. Each company has seriously considered the investment cost and revenue from CDM before the starting date of project.

Bundle number	Company	Region	Fuel used in baseline situation
1	Youngjin Chemical Co., Ltd.	Gyeonggi-do	Bunker fuel oil C
2	Sammi Industrial Co., Ltd.		Bunker fuel oil C
3	Asia Stabilizers Co., Ltd.		Bunker fuel oil C

The main purpose of the project activity is to reduce GHG emissions through fossil fuel switching. The GHG emissions reduction through this project activity is around 6,390tCO_2e/yr.

By switching fossil fuel from bunker fuel oil C to NG, the project will result in several sustainable development benefits, including (but not limited to) the following:

- Reduction of GHG compared to baseline situation.
- Reduction of air pollutants such as SOx, NOx and particulate matter.
- Improved air quality of the region.
- Safety because NG is supplied through pipeline.

- Decreased use of vehicles for fuel transportation because NG is supplied by pipeline.
- A clean technology demonstration project which could be replicated across the Republic of Korea.

When the fuels such as NG, oil, and coal are combusted, emitted pollutants of each fuel are as follows:

Pollutant	NG	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulphur Dioxide	1	1,122	2,591
Particles	7	84	2,744
Mercury	0.000	0.007	0.016

<Fossil fuel emission levels – Pounds per Billion Btu of Energy Input>
(Source: EIA - NG Issues and Trends 1998)

A.3. Project participants:

Name of Party involved(*) ((Host) indicates a Host Party)	Private and/or public entity(ies) project participants	Kindly indicates if the Party(ies) involved wish to be considered a project participant (yes/no)
The Republic of Korea (Host Party)	Private entity - Samchully Co., Ltd.	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Republic of Korea

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

- Bundle project 1 - Youngjin Chemical Co., Ltd.: Gyeonggi-do
- Bundle project 2 - Sammi Industrial Co., Ltd.: Gyeonggi-do
- Bundle project 3 - Asia Stabilizers Co., Ltd.: Gyeonggi-do

A.4.1.3. City/Town/Community etc:

- Bundle project 1 - Youngjin Chemical Co., Ltd.: Bucheon-si, Gyeonggi-do
- Bundle project 2 - Sammi Industrial Co., Ltd.: Ansan-si, Gyeonggi-do
- Bundle project 3 - Asia Stabilizers Co., Ltd.: Pyeongtaek-si, Gyeonggi-do

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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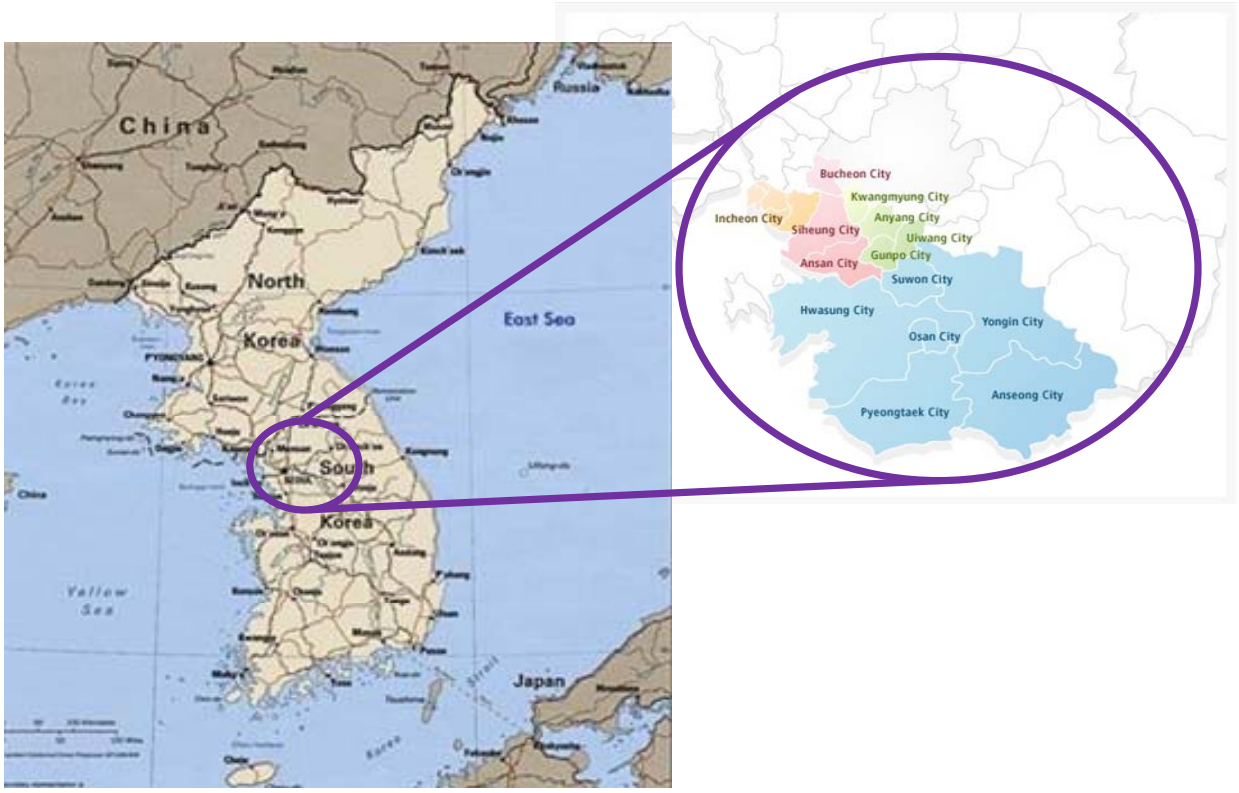
The bundling CDM project activity is implemented at three companies' factories. The three companies are Youngjin Chemical, Sammi Industrial, and Asia Stabilizers.

Youngjin Chemical Co., Ltd.(bundle 1) is located in Bucheon-si at latitude 37°31', longitude 126°45'.

Sammi Industrial Co., Ltd.(bundle 2) is located in Ansan-si at latitude 37°19', longitude 126°49'.

Asia Stabilizers Co., Ltd.(bundle 3) is located in Pyeongtaek-si at latitude 37°1', longitude126°57'.



<Location of project>

No	Company name	Latitude	Longitude	Location
1	Youngjin Chemical	37°31'	126°45'	Bucheon-si
2	Sammi Industrial	37°19'	126°49'	Ansan-si
3	Asia Stabilizers	37°1'	126°57'	Pyeongtaek-si

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

In accordance with Appendix B of the simplified modalities and procedures for small-scale clean development mechanism project activities ("SSC M&P"), the project activity falls under the following type and category:

Type III: Other project activities
- Main purpose of this project activity is not energy efficiency improvement. Also it does not include the renewable energy category.

Category B: Switching Fossil Fuels (Version 13)
- This project activity switches high carbon fossil fuel to NG.

Sectoral Scope 1 – Energy industries (renewable - / non-renewable sources)
- This project activity reduces GHG by switching energy source.

- Youngjin Chemical Co., Ltd.

Youngjin Chemical was established in 1969 as the first Solid Caustic Soda Flake manufacturer in the Republic of Korea. The company yearly produces 25,000tons of Solid Caustic Soda Flake at the present time. Youngjin Chemical produces 98% Caustic Soda by using heat medium boiler(boiler 1). When 98% caustic soda is produced, the high heat over 400 degrees C is needed. Since only the heat medium boiler can make the heat over 400 degrees C, it is used for the production of 98% caustic soda. Also, Youngjin Chemical produces 70% Caustic Soda, Phosphate, Silicate, Ferrous Sulfate, and Calcium Nitrate by using flue smoke tube boiler(boiler 2).

This company has used bunker fuel oil C in baseline situation. Though prices of NG and investment cost for fossil fuel switching are high, the company decided to implement fossil fuel switching for GHG emission reduction. This implementation was possible because of the financial benefits of CDM. The company started a fuel switching process on 17 Oct 2008. The project activity involves retrofit of the two boilers to allow change of fuel from bunker fuel oil C to NG. The Retrofit of boiler means replacement of existing burner. Thermal which is produced from boilers is used in the process of reacting, concentrating, and dry.

Specification of boilers is as follow:

Boiler number	Type	Capacity	Installed year[1]
1	Heating medium boiler	4,000,000kcal/hr	2001
2	Flue smoke tube boiler	5ton/hr	2001
Boiler number	**Design pressure**	**Fuel used**	**Technology used**
1	15kg/cm^2 g	Bunker fuel oil C	Replacement of burner
2	16kg/cm^2 g	Bunker fuel oil C	Replacement of burner

[1] Baseline boiler purchase and installation contract date is applied.

- Sammi Industrial Co., Ltd.

Sammi Industrial was established in 1968 for manufacturing gelatin. The company acquired ISO 9002 registration in 2000 and acquired GMP (Good Manufacturing Practice) registration from Korea Food & Drug Administration in 2001. Main product of the company is gelatin which is used for food and drug.

This company has used bunker fuel oil C in baseline situation. Though prices of NG and investment cost for fossil fuel switching are high, the company decided to implement fossil fuel switching for GHG emission reduction. This implementation is possible because of the financial benefits of CDM. The company started a fuel switching process on 3 Dec 2008. The project activity involves retrofit of the two boilers to allow change of fuel from bunker fuel oil C to NG. The retrofit of boiler means the replacement of existing burner. Thermal, which is produced from the boilers, is used in the process of concentrating, extracting, and drying.

Specification of boilers is as follow:

Boiler number	**Type**	**Capacity**	**Installed year**
1	Flue smoke tube boiler	8ton/hr	2001
2	Flue smoke tube boiler	6ton/hr	2001
Boiler number	**Design pressure**	**Fuel used**	**Technology used**
1	10kg/cm^2 g	Bunker fuel oil C	Replacement of burner
2	14kg/cm^2 g	Bunker fuel oil C	Replacement of burner

- Asia Stabilizers Co., Ltd.

Asia Stabilizers was established in 1993. The company has technologies for producing antioxidants and UV stabilizers.

This company has used bunker fuel oil C in baseline situation. Though prices of NG and investment cost for fossil fuel switching are high, the company decided to implement fossil fuel switching for GHG emission reduction. This implementation is possible because of the financial benefits of CDM. The company started a fuel switching process on 17 Feb 2009. The project activity involves replacement of one burner and one boiler to allow change of fuel from bunker fuel oil C to NG. Thermal which is produced from boilers is used in the process of reacting and drying.

Specification of boilers is as follows:

Boiler number	**Type**	**Capacity**	**Installed year**
1	Flue smoke tube boiler	10ton/hr	1993
Boiler number	**Design pressure**	**Fuel used**	**Technology used**
1	10kg/cm^2 g	Bunker fuel oil C	Replacement of burner and boiler

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

- Youngjin Chemical Co., Ltd.

Years	Annual estimation of emission reductions in tonnes of CO2e
2010(August~)	1,081
2011	2,595
2012	2,595
2013	2,595
2014	2,595
2015	2,595
2016	2,595
2017	2,595
2018(~June)	1,297
Total estimated reductions(tonnes of CO2e)	20,543
Total number of crediting years	7years and 11months
Annual average over the crediting periods of estimated reductions (tonnes of CO2e)	2,595

- Sammi Industrial Co., Ltd.

Years	Annual estimation of emission reductions in tones of CO_2e
2010(~August)	844
2011	2,027
2012	2,027
2013	2,027
2014	2,027
2015	2,027
2016	2,027
2017	2,027
2018(~June)	1,013
Total estimated reductions(tones of CO2e)	16,046
Total number of crediting years	7years and 11months
Annual average over the crediting periods of estimated reductions (tones of CO2e)	2,027

- Asia Stabilizers Co., Ltd.

Years	Annual estimation of emission reductions in tones of CO_2e
2010(August~)	736
2011	1,768
2012	1,768
2013	1,768
2014	1,768
2015	1,768
2016	1,768
2017	1,768
2018(~June)	884
Total estimated reductions(tones of CO2e)	13,996
Total number of crediting years	7years and 11months
Annual average over the crediting periods of estimated reductions (tones of CO2e)	1,768

- Grand total of annual estimation of emission reductions in tonnes of CO2e

Years	Annual estimation of emission reductions in tones of CO_2e
2010(~August)	2,661
2011	6,390
2012	6,390
2013	6,390
2014	6,390
2015	6,390
2016	6,390
2017	6,390
2019(~June)	3,194
Total estimated reductions(tones of CO2e)	50,585
Total number of crediting years	7years and 11months
Annual average over the crediting periods of estimated reductions (tones of CO2e)	6,390

A.4.4. Public funding of the small-scale project activity:

Project financing will not involve ODA or public funding from Annex I countries

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, debundling is defined as the fragmentation of a large project activity into smaller parts. Three bundled small-scale fossil fuel switching projects reduce about 6,390tCO_2/yr. None of these are part of a large project.

According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity meeting the following requirements:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The proposed project activity is the first project activity proposed by the project participant. Samchully is the first to carry-out this small-scale CDM project, and therefore this project is not a debundled project. The proposed bundled project will stay consistent with the requirements of Appendix C, paragraph 2 of the simplified modalities and procedures for small-scale CDM project activities:

Appendix C, paragraph 2 requirements	The proposed project
"Small-scale CDM project activity with the same project participants"	No other project activity has been registered by the project developer.
"Small-scale CDM project activity in the same project category and technology/measure"	The proposed project activity is a small-scale project activity implemented using III.B. "Switching Fossil Fuel" methodology. There is no project activity at Samchully in the same project category with or using the same technology.
"Small-scale CDM project activity registered within the previous 2 years"	No other project activity, small or large, was registered or brought for registration by the project participant.

Appendix C, paragraph 2 requirements	The proposed project
"Small-scale CDM project activity whose project boundary is within 1km of the project boundary of the proposed small-scale activity at the closest point"	"K-water Wind Power Plant CDM project" and "Sihwa Tidal Power Plant CDM project" have been registered in Ansan-si. However, "K-water Wind Power Plant CDM project" is not located within 1km of the project boundary of the proposed project at the closest point and use AMS I.D. Also, "Sihwa Tidal Power Plant CDM project" is not located within 1km of the project boundary of the proposed project at the closest point and use ACM 0002. "Korea Land Corporation Pyeongtaek Sosabul-district new and renewable energy model city" project has been registered in Pyeongtaek-si. However, this renewable energy project is not located within 1km of the project boundary of the proposed project at the closest point and use AMS I.D. No other project activity has been registered or brought for registration in Bucheon-si or anywhere within 1km of the project activity.

The bundled projects are implemented at Ansan-si, Pyeongtaek-si, Bucheon-si. Some CDM projects are registered at Ansan-si and Pyeongtaek-si. But the registered projects are not located within 1km of project boundary. The registered projects used different methodology with the bundled fossil fuel switching project. No CDM projects are registered at Bucheon-si. The proposed bundled project will stay consistent with the requirements of Appendix C, paragraph 2 of the simplified modalities and procedures for small-scale CDM project activities. Thus, the proposed project activity is not a part of debundled large-scale project.

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SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The project activity will use the approved baseline and monitoring small-scale methodology Type III.B – Switching Fossil Fuels (Version 13).

B.2 Justification of the choice of the project category:

The project activity is applicable to small-scale methodology type III.B. -Switching Fossil Fuels:

· Methodology AMS- III.B. – Switching Fossil Fuels. (Version 13)

The project attends to all of the applicability requirements required by AMS-III.B. This category comprises "Other Project Activity" sources such as fuel switch from bunker fuel oil C to NG. This fuel switching CDM bundling project will use NG in the boiler and reduce GHG emissions about 6,390 tons CO_2e average per year.

- Project Type
  Type III – Other project activities
- Project Category
  III.B. – Switching Fossil Fuels
- Technology/Measure
  1. This methodology comprises fossil fuel switching in industrial, residential, commercial, institutional or electricity generation applications. (e.g. fuel switch from fuel oil to NG in an existing captive electricity generation or replacement of a fuel oil boiler by a NG boiler).
  2. Retrofit or replacement of existing installations is eligible under this methodology.
  3. Fuel switching may also result in energy efficiency improvements. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this methodology. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls under AMS II.D or II.E.
  4. New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible to apply this methodology if they comply with the requirements in the General Guidance for SSC methodologies concerning these topics. In addition, the requirements for demonstration of the remaining lifetime of the equipment replaced as described in the General Guidance shall be followed.
  5. This methodology is not applicable to project activities that propose switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario. A relevant Type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use. This methodology is also not applicable to project activities involving the use of waste gas; these project activities might be eligible under AMS III.Q.
  6. In the case of existing facilities, historical information (detailed records) on the fuel usage and the plant output (e.g. heat or electricity) in the baseline captive energy generation from at least 3 years prior to project implementation shall be used in the baseline calculations, along with information on coal use and heat output by a district heating plant, liquid fuel oil use and electricity generated by a generating unit (records of fuel used and output can be used actual collecting baseline validation

data). For facilities that are less than 3 years old, historical data shall be available (a minimum of one year data would be required).
7. Multiple fossil fuel switching is not covered under this methodology.
8. Measures are limited to those that result in emission reductions of less than or equal to 60 $ktCO_2$ equivalent annually.

The proposed project activity is fuel switching from bunker fuel oil C to NG in industrial. This project comprises replacement of burners/boilers. The project activity primarily aims at reducing GHG emissions through fuel switching, from bunker fuel oil C to NG, in Gyeonggi-do. This project is not a project activity that proposes switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario. The data used to calculate baseline emissions was based on the period prior to decision-making for 3 years. This project comprises NG fuel switching but may result in energy efficiency as well. However, the main purpose of the project activity is fuel switching, not energy efficiency. Also, in any year of the crediting period, emissions reductions resulting from the project activity will not exceed 60 $ktCO_2e$ annually. Therefore the project activity falls under category B, Switching fuels.

According to "Tool to determine the remaining lifetime of equipment (Version 01)", project participant may use one of the following options to determine the remaining lifetime of the equipment:

(a) Use manufacturer's information on the technical lifetime of equipment and compare to the date of first commissioning;
(b) Obtain an expert evaluation;
(c) Use default values.

Default values from "Tool to determine the remaining lifetime of equipment (Version 01)" are as follows:

Equipment	Default value for technical lifetime
Boilers	25 years
Steam Turbines	25 years
Gas turbines, up to 50 MW capacity	150,000 hours
Gas turbines, above 50 MW capacity	200,000 hours
Hydro turbines	150,000 hours
Electric Generators, air cooled	25 years
Electric generators, hydrogen cooled or water cooled	30 years
Wind turbines, onshore	25 years
Wind turbines, offshore	20 years
Diesel/oil/gas fired generator sets	50,000 hours
Transformers	30 years
Heaters, chillers, pumps, etc. used in HVAC systems	15 years

Project participant applied option C for all the boilers.

All boilers involved in this project have been operated and maintained according to the recommendations of the equipment supplier. There are no periodic replacement schedules or scheduled replacement practices. Also, all boilers involved in this project have no design fault or defect and did not have any

industrial accident. So, Option C could be applied for this project.

The first commissioning dates of baseline boilers are listed table below. The installation inspection certificates for each boiler supporting documents for commissioning dates are provided to DOE.

Company	Boiler number	The date of first commissioning
Youngjin Chemical	Boiler 1	01/04/2002
	Boiler 2	13/11/2001
Sammi Industrial	Boiler 1	29/05/2001
	Boiler 2	09/02/2001
Asia Stabilizers	Boiler 1	07/07/1993

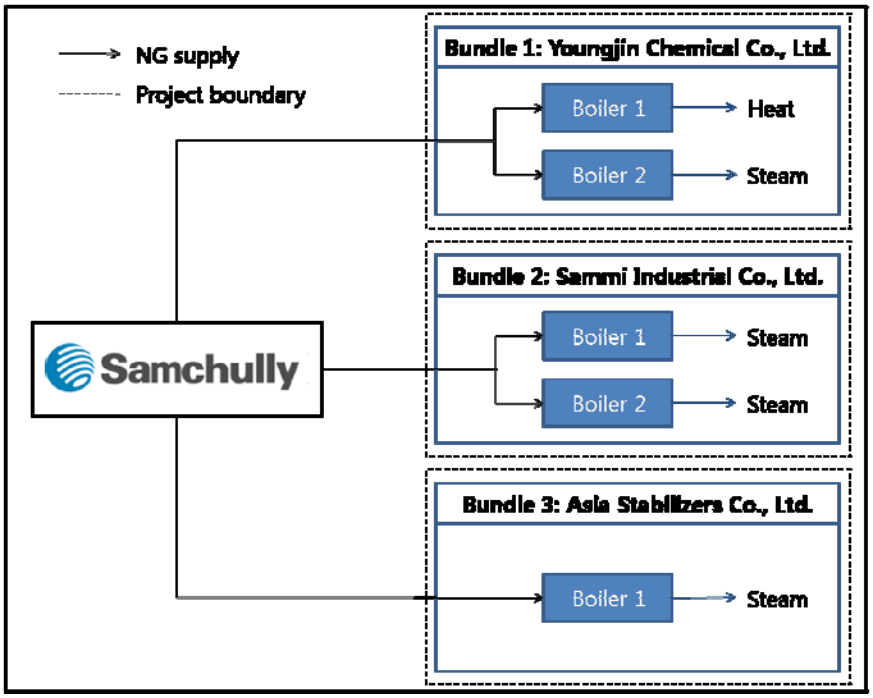
According to the daily boiler log sheets, each boiler is operated less than 365 days per year and is operated less than 24hours per day. For conservative approach the project participant suppose that the boilers involved in the project are operated 24 hours per day and 365 days per year from the first commissioning date. Thus, last day of remaining lifetime for each boiler is calculated as listed table below because all the boilers included in the bundling project applies 25 years as technical lifetime.

Company	Boiler number	Last day of remaining lifetime
Youngjin Chemical	1	31/03/2027
	2	12/11/2026
Sammi Industrial	1	28/05/2026
	2	08/02/2026
Asia Stabilizers	1	06/07/2018

The project participant selects the last day of remaining lifetime of Asia Stabilizers for all the boilers involved in the project. This approach is conservative. So, last day of remaining lifetime for all the boilers is 06/07/2018. Credit period for this project would be the period from registration date to 06/07/2018

B.3. Description of the project boundary:

As per the baseline methodology, the project boundary is the physical, geographical site where the fuel combustion affected by the fuel switching measure occurs. Therefore the project boundary encompasses the boilers that undergo the fuel switching at the three companies.



B.4. Description of baseline and its development:

The project activity involves a fuel switch to NG on equipment that has used bunker fuel oil C historically. The emission baseline is the current emissions of the facility. In the absence of the project activity, the factories in Gyeonggi-do would be utilizing bunker fuel oil C for getting calories, which is the current situation. Under the current regulations, it is allowed to use bunker fuel oil C in Gyeonggi-do and there are no regulations that require the use of NG or any other fuel. It is also technically feasible to use other fossil fuels, such as diesel, kerosene, gasoline, light oil or LPG as fuel sources. However, due to its high price per caloric values, such fuels are seldom used as fuel source in these types of equipment and facility. Generally, gasoline and light oil are used in transportation sector, kerosene and LPG are used in residential and commercial sector, diesel is used for emergency. In industrial sector, only bunker fuel oil C and NG are used in Korea. Thus, the alternatives of using other fuels than NG was excluded.

Also, as shown in Section B.5 below, it is not economically attractive to switch fuel from bunker fuel oil C to NG. Therefore, the current situation of using bunker fuel oil C for getting calories is considered as a baseline scenario for the project activity. The data used to demonstrate additionality was based on the period prior to decision-making for 3 years.
Emission reductions will be determined using actual data which are to be monitored. The key variables and parameters used to calculate the emission reductions are as follows:

Variables & Parameters	Data source
Quantity of NG combusted in the boiler	Samchully, Each company(Youngjin Chemical, Sammi Industrial, Asia Stabilizers)
Quantity of bunker fuel oil C combusted in the boiler	Each company (Youngjin Chemical, Sammi Industrial, Asia Stabilizers)

Quantity of output heat by NG combustion	Each company (Youngjin Chemical, Sammi Industrial, Aju Ascon, Asia Stabilizers)
Average net calorific value of the NG	Standard Manual for Calorific Value[1)]
Average net calorific value of the bunker fuel oil C	Standard Manual for Calorific Value[1)]
CO_2 emission factor of the NG	IPCC default value
CO_2 emission factor of the bunker fuel oil C	IPCC default value

1) The Standard Manual for Calorific Value from "Framework Act on the Energy"

Bunker fuel oil C use and output energy data for each company are as follows:

- Youngjin Chemical Co., Ltd.

Boiler number	Year	Bunker fuel oil C use	Output Energy
1	2005	2,023,937 L	30.1 TJ
	2006	2,220,874 L	32.8 TJ
	2007	2,156,645 L	33.2 TJ
	Average	2,133,819 L	32.0 TJ
2	2005	889,645 L	40.6 TJ
	2006	1,050,876 L	43.2 TJ
	2007	1,006,364 L	38.7 TJ
	Average	982,295 L	40.8 TJ

- Sammi Industrial Co., Ltd.

Boiler number	Year	Bunker fuel oil C use	Output Energy
1	2005	2,372,055 L	85.1 TJ
	2006	2,288,284 L	85.5 TJ
	2007	2,495,811 L	93.0 TJ
	Average	2,385,383 L	87.9 TJ
2	2005	62,770 L	1.9 TJ
	2006	40,560 L	1.2 TJ
	2007	39,290 L	1.1 TJ
	Average	47,540 L	1.4 TJ

- Asia Stabilizers Co., Ltd.

Boiler number	Year	Bunker fuel oil C use	Output Energy
1	2005	2,069,678 L	68.1 TJ
	2006	2,166,122 L	70.1 TJ
	2007	2,135,658 L	74.4 TJ
	Average	2,123,819 L	70.9 TJ

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Prior consideration of the CDM

Project participant had awareness of the CDM prior to the project activity start date. Also, the benefits of the CDM were a decisive factor in the decision to proceed with the project. Thus, the three companies which participate in this bundling project seriously considered the benefits of the CDM in the decision to undertake the project as a CDM project activity before the start of the project activity. Evidence to support this can be confirmed by following tables.

- The timeline for CDM consideration prior to the project activity starting date(Youngjin Chemical)

Youngjin Chemical started investigation fossil fuel switching CDM project at 20/08/2008. After the investigation, Youngjin Chemical requested CDM project presentation to Samchully. At 15/10/2008, Samchully had presentation about CDM project at Youngjin Chemical office. Before the presentation, Samchully received company data. Based on this data, CDM project economic analysis is performed. Based on presentation material, Youngjin Chemical held working-level talks and meeting of the Board of Directors for fossil fuel switching CDM project.

As a result of several reviews and meetings, Youngjin Chemical contracted for burner purchase and installation at 17/10/2008. Thus, the start date of Youngjin Chemical bundled project is 17/10/2008. After start date, Youngjin Chemical contracted for NG supply with Samchully and contracted for construction for fuel supply.

Thus, Youngjin Chemical had awareness of the CDM before the project activity start date and decided to start the project activity based on serious consideration of the benefits of the CDM.

Date	Document
20/08/2008	Draft document for CDM project development
15/10/2008	Feasibility study presentation material
15/10/2008	Economic analysis material
15/10/2008	Minutes related to the CDM consideration
15/10/2008	Minutes related to the CDM consideration of the decision by the Board of Directors
17/10/2008	Contract for burner purchase and installation
23/10/2008	Contract for NG supply with Samchully
23/10/2008	Contract for construction for fuel supply

- The timeline for CDM consideration prior to the project activity starting date(Sammi Industrial)

Sammi Industrial sent draft which requested to participate in the meeting about fossil fuel switching CDM project at 16/04/2007. Sammi Industrial held the meeting of the Board of Directors for fossil fuel switching CDM project at 24/04/2007. Samchully which was planning bundling CDM project had presentation about CDM project at Sammi Industrial office at 13/11/2008. Before the presentation, Samchully received company data for economic analysis. Based on this data, CDM project economic analysis is performed. Based on presentation material, Sammi Industrial held working-level talks. As a result of working-level talks, Draft for confirming of participating in fossil fuel CDM project was made at 15/11/2008.

As a result of several reviews and meetings, Sammi Industrial contracted for burner purchase and installation at 03/12/2008. Thus, the start date of Sammi Industrial bundled project is 03/12/2008. After start date, Sammi Industrial contracted for construction for fuel supply at 04/12/2008 and contracted for NG supply with Samchully at 15/12/2008.

Thus, Sammi Industrial had awareness of the CDM before the project activity start date and decided to start the project activity based on serious consideration of the benefits of the CDM.

Date	Document
16/04/2007	Draft document for CDM project development
24/04/2007	Minutes related to the CDM consideration of the decision by the Board of Directors
13/11/2008	Feasibility study presentation material
13/11/2008	Economic analysis material
13/11/2008	Minutes related to the CDM consideration
15/11/2008	Draft document for CDM project development
03/12/2008	Contract for burner purchase and installation
04/12/2008	Contract for construction for fuel supply
15/12/2008	Contract for NG supply with Samchully

- The timeline for CDM consideration prior to the project activity starting date(Asia Stabilizers)

Samchully which was planning bundling CDM project had presentation about CDM project at Asia Stabilizers office at 14/10/2008. Before the presentation, Samchully received company data for economic analysis. Based on this data, CDM project economic analysis is performed. Based on presentation material, Asia Stabilizers held the meeting of the Board of Directors for fossil fuel switching CDM project at 01/12/2008.

As a result of several reviews and meetings, Asia Stabilizers contracted for NG supply with Samchully at 02/12/2008 and contracted for construction for fuel supply at 10/02/2009. Asia Stabilizers also contracted for burner purchase and installation at 17/02/2009. The start date of Asia Stabilizers bundled project is 17/02/2009 because burner is main equipment. After the start date, Asia Stabilizers contracted for boiler purchase and installation at 25/02/2009.

Thus, Asia Stabilizers had awareness of the CDM before the project activity start date and decided to start the project activity based on serious consideration of the benefits of the CDM.

Date	Document
14/10/2008	Feasibility study presentation material
14/10/2008	Economic analysis material
14/10/2008	Minutes related to the CDM consideration of the decision by the Board of Directors
02/12/2008	Contract for NG supply with Samchully
10/02/2009	Contract for construction for fuel supply
17/02/2009	Contract for burner purchase and installation
25/02/2009	Contract for boiler purchase and installation

Notification to the DNA of the Republic of Korea

A project activity with a start date on or after 2 August 2008 must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Start date of this bundling project is after 2 August 2008. According to "Guidance on the Demonstration and Assessment of Prior Consideration of the CDM", project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity

and of their intention to seek CDM status.

In order to register the project activity Samchully informed the DNA of the Republic of Korea in writing of the commencement of the project activity and of intention of Samchully to seek CDM status at 26 February 2009. Thus, project participant could ensure that they seriously considered this project as a CDM project.

As described in the Section B.4, the use of bunker fuel oil C at Gyeonggi-do area is allowed and there are no regulations that require the use of NG or any other fuel. Therefore the fuel used for getting calories is decided based on economics. Thus, in the absence of the CDM, the project activity could not be implemented due to the following insurmountable barrier:

Investment barrier
The additionality of the project activity is assessed and demonstrated by investment barrier. Since the price of NG is higher than that of bunker fuel oil C in the Republic of Korea (average three years price), fuel switching from bunker fuel oil C to NG requires significant amount of additional fuel costs. The fuel switching requires investments for connecting the plant to the gas supply pipeline, internal pipeline installation, and equipment conversions from fuel oil to NG.

- Average fuel cost for 3 years (2005~2007)

Company	Fuel	Cost (KRW/unit)	Source
Youngjin Chemical	Bunker fuel oil C	489.1	Tax Invoice and Youngjin Chemical Data
	NG	526.8	Korea Gas Corporation
Sammi Industrial	Bunker fuel oil C	473.1	Tax Invoice
	NG	526.8	Korea Gas Corporation
Asia Stabilizers	Bunker fuel oil C	457.9	Tax Invoice
	NG	526.8	Korea Gas Corporation

As described in the table below, NPV of the project activity is negative, which means that the project activity is not economically attractive. Therefore, in the absence of the CDM, the project activity could not be implemented.

- Result of Economic Analysis

Company	Cost	Baseline scenario (Bunker fuel oil C)	Project scenario (NG)
Youngjin Chemical	Investment Cost	0 KRW	122,217,080 KRW
	O&M costs	31,216,638 KRW/y	14,315,891 KRW/y
	Fuel consumption	1,524,032,904 KRW/y	1,604,663,844 KRW/y
	NPV of the project activity	-1,040,571,300 KRW	
Sammi Industrial	Investment Cost	0 KRW	199,781,757 KRW
	O&M costs	30,714,999 KRW/y	14,494,247 KRW/y
	Fuel consumption	1,150,960,584 KRW/y	1,252,850,354 KRW/y
	NPV of the project activity	-1,434,275,164 KRW	
Asia Stabilizers	Investment Cost	0 KRW	262,782,970 KRW
	O&M costs	25,473,040 KRW/y	11,583,647 KRW/y
	Fuel consumption	934,480,507 KRW/y	1,093,675,115 KRW/y
	NPV of the project activity	-1,810,338,318 KRW	

Note
1. A discount rate of 4.78% was applied to net present value analysis. This discount rate has been substantiated by annual interest rate(%) of government bond(3 year term: 2005-2007)
2. Net calorific value of bunker fuel oil C and NG are adopted from The Standard Manual for Calorific Value from "Framework Act on the Energy".

Barrier due to prevailing practice

The prevailing practice of industrial process is the use of bunker fuel oil C in the boiler. It should be noted that three companies have no obligation to use NG. It means that the three companies had no incentive to migrate to NG due to environmental requirements, and considering supply uncertainties, the prevailing practice would be more predictable and feasible.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions

The emission baseline is the current emissions of the facility expressed as emissions per unit of output. Baseline emissions shall be determined as follows:

$$BE_y = EF_{BSL} \times Q_y$$

Where:

BE_y	Baseline emissions in the project activity in year *y* (tCO_2e)
EF_{BSL}	Emission factor for the baseline situation (tCO_2/TJ)
Q_y	Net output(Heat generated) in the project activity in year y (TJ)

The emission factor in the baseline situation (EF_{BSL}) is the coefficient for the fossil fuel used in the baseline expressed as emissions per unit of output(Heat generated).

$$EF_{BSL} = (FC_{BSL} \times EF_{CO2} \times NCV_{BSL}) / Q_{BSL}$$

Where:

FC_{BSL}	Total amount of fossil fuel consumed for captive energy generation in the baseline situation (ℓ/y)
EF_{CO2}	CO_2 emission factor for the baseline fossil fuel (tCO_2/TJ)
NCV_{BSL}	Net calorific value for the baseline fossil fuel (TJ/ℓ)
Q_{BSL}	Net output(Heat generated) in the captive plant in the baseline situation during the corresponding period of time for which the total fuel consumption was taken (TJ)

Project emissions

Project activity emissions consist of those emissions related with the use of fossil fuel after the fuel switch. Project emissions are determined as follows:

$$PE_y = FC_y \times EF_{CO2} \times NCV_{NG}$$

Where:

PE_y	Project emissions in the project activity in year y (tCO_2e)
FC_y	Amount of NG consumed for captive energy generation in the project activity in year y (m^3/y)
EF_{CO2}	CO2 emission factor for NG (tCO_2/TJ)
NCV_{NG}	Net calorific value for NG (TJ/m^3)

Leakage

As described in AMS III.B, no leakage calculation is required.

Emission reductions

$ER_y = BE_y - PE_y$

where,

ER_y	Emissions reductions of the project activity during the year y (tCO_2e/y)
BE_y	Baseline emissions during the year y (tCO_2e/y)
PE_y	Project emissions during the year y (tCO_2e/y)

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

Data / Parameter:	NCV_{BC}
Data unit:	TJ/ℓ,
Description:	Net calorific value of bunker fuel oil C that would be combusted in the absence of the project activity
Source of data used:	The Standard Manual for Calorific Value from "Framework Act on the Energy"
Value of data	39.1 x 10^{-6} TJ/ℓ
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accurate and reliable national data is used. The value of data is from the "Standard Manual for Calorific Value" approved by Ministry of Knowledge Economy/ Korea Energy Management Corporation.
Any comment:	

Data / Parameter:	NCV_{NG}
Data unit:	TJ/m^3
Description:	Net calorific value of NG
Source of data used:	The Standard Manual for Calorific Value from "Framework Act on the Energy"
Value of data	40.0 ×10^{-6} TJ/m^3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accurate and reliable national data is used. The value is from the "Standard Manual for Calorific Value" approved by Ministry of Commerce, Industry and Energy/ Korea Energy Management Corporation.
Any comment:	

Data / Parameter:	$EF_{CO2,BC}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of bunker fuel oil C that would be combusted in the absence of the project activity
Source of data used:	IPCC default value
Value of data	77.4 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since accurate and reliable national data is not available, default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories is used. (Table 1.4)
Any comment:	

Data / Parameter:	$EF_{CO2,NG}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of the NG combusted
Source of data used:	IPCC default value
Value of data	56.1 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the accurate and reliable national data is not available, default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories is used. (Table 1.4)
Any comment:	

Data / Parameter:	$FC_{BC,i}$
Data unit:	ℓ/y
Description:	Amount of bunker fuel oil C used in the project boiler i before the implementation of the project activity
Source of data used:	On-site data of each factory
Value of data	- $FC_{BC,\text{Youngjin Chemical\_1}}$: 2,133,819ℓ/y - $FC_{BC,\text{Youngjin Chemical\_2}}$: 982,295ℓ/y - $FC_{BC,\text{Sammi Industrial\_1}}$: 2,385,383ℓ/y - $FC_{BC,\text{Sammi Industrial\_2}}$: 47,540ℓ/y - $FC_{BC,\text{Asia Stabilizers\_1}}$: 2,123,819ℓ/y
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average value over 3 year(2005~2007)
Any comment:	

Data / Parameter:	Q_{BSL}
Data unit:	TJ/y
Description:	Net energy generated in the captive plant in the baseline situation during the corresponding period of time for which the total fuel consumption was taken
Source of data used:	On-site data of each factory
Value of data	- $Q_{BSL, Youngjin\_Chemical\_1}$: 32.0 TJ/y - $Q_{BSL, Youngjin\_Chemical\_2}$: 40.8 TJ/y - $Q_{BSL, Sammi\_Industrial\_1}$: 87.9 TJ/y - $Q_{BSL, Sammi\_Industrial\_2}$: 1.4 TJ/y - $Q_{BSL, Asia\ Stabilizers\ 1}$: 70.9 TJ/y
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average value over 3 year(2005~2007)
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Project emissions

- Youngjin Chemical

$PE_{y, Youngjin\ Chemical} = PE_{y, Youngjin\ Chemical\_1} + PE_{y, Youngjin\ Chemical\_2}$
$= 4{,}681(tCO_2e/year) + 2{,}155(tCO_2e/year)$
$= 6{,}836\ tCO_2e/year$

$PE_{y, Youngjin\ Chemical\_1} = FC_{y, Youngjin\ Chemical\_1} \times NCV_{NG} \times EF_{CO2, NG}$
$= 2{,}085{,}808(m^3/year) \times 40.0 \times 10^{-6}(TJ/m^3) \times 56.1(tCO_2e/TJ)$
$= 4{,}681\ tCO_2e/year$
$PE_{y, Youngjin\ Chemical\_2} = FC_{y, Youngjin\ Chemical\_2} \times NCV_{NG} \times EF_{CO2, NG}$
$= 960{,}193(m^3/year) \times 40.0 \times 10^{-6}(TJ/m^3) \times 56.1(tCO_2e/TJ)$
$= 2{,}155\ tCO_2e/year$

- Sammi Industrial

$PE_{y, Sammi\ Industrial} = PE_{y, Sammi\ Industrial\_1} + PE_{y, Sammi\ Industrial\_2}$
$= 5{,}232(tCO_2e/year) + 104(tCO_2e/year)$
$= 5{,}336\ tCO_2e/year$

$PE_{y, Sammi\ Industrial\_1} = FC_{y, Sammi\ Industrial\_1} \times NCV_{NG} \times EF_{CO2, NG}$
$= 2{,}331{,}712(m^3/year) \times 40.0 \times 10^{-6}(TJ/m^3) \times 56.1(tCO_2e/TJ)$
$= 5{,}232\ tCO_2e/year$

$PE_{y,\ Sammi\ Industrial\_2} = FC_{y,\ Sammi\ Industrial\_2} \times NCV_{NG} \times EF_{CO2,\ NG}$
$= 46{,}470(m^3/year) \times 40.0 \times 10^{-6}(TJ/m^3) \times 56.1(tCO_2e/TJ)$
$= 104\ tCO_2e/year$

- Asia Stabilizers

$PE_{y,\ Asia\ Stabilizers} = PE_{y,\ Asia\ Stabilizers\_1}$
$= 4{,}659\ tCO_2e/year$

$PE_{y,\ Asia\ Stabilizers\_1} = FC_{y,\ Asia\ Stabilizers\_1} \times NCV_{NG} \times EF_{CO2,\ NG}$
$= 2{,}076{,}033(m^3/year) \times 40.0 \times 10^{-6}(TJ/m^3) \times 56.1(tCO_2e/TJ)$
$= 4{,}659\ tCO_2e/year$

Company	Project Emissions(tCO_2e/year)
Youngjin Chemical	6,836
Sammi Industrial	5,336
Asia Stabilizers	4,659
Total	16,831

Quantity of natural gas combusted in the project scenario(FC_y) is estimated for ex-ante purpose based on the historical bunker fuel consumption, net calorific value of bunker fuel oil and natural gas.

Baseline Emissions

- Youngjin Chemical

$BE_{y,\ Youngjin\ Chemical} = BE_{y,\ Youngjin\ Chemical\_1} + BE_{y,\ Youngjin\ Chemical\_2}$
$= 6{,}458\ tCO_2e/year + 2{,}973\ tCO_2e/year$
$= 9{,}431\ tCO_2e/year$

$BE_{y,\ Youngjin\ Chemical\_1} = EF_{BSL,\ Youngjin\ Chemical\_1} \times Q_{y,\ Youngjin\ Chemical\_1}$
$= 201.80(tCO_2e/TJ) \times 32.0(TJ/year)$
$= 6458\ tCO_2e/year$

$$EF_{BSL,\ Youngjin\ Chemical\_1} = \frac{FC_{BC,Youngjin\ Chemical\_1} \times NCV_{BC} \times EF_{CO2,BC}}{Q_{BSL,Youngjin\ Chemical\_1}}$$

$$= \frac{2{,}133{,}819\left(L/year\right) \times 39.1 \times 10^{-6}\left(TJ/L\right) \times 77.4\left(tCO_2e/TJ\right)}{32.0\left(TJ/year\right)}$$

$= 201.80\ tCO_2e/TJ$

$BE_{y,\ Youngjin\ Chemical\_2} = EF_{BSL,\ Youngjin\ Chemical\_2} \times Q_{y,\ Youngjin\ Chemical\_2}$
$= 72.86(tCO_2e/TJ) \times 40.8(TJ/year)$
$= 2{,}973\ tCO_2e/year$

$$EF_{BSL,\ Youngjin\ Chemical\_2} = \frac{FC_{BC,Youngjin\ Chemical\_2} \times NCV_{BC} \times EF_{CO2,BC}}{Q_{BSL,Youngjin\ Chemical\_2}}$$
$$= \frac{982{,}295\left(L/year\right) \times 39.1 \times 10^{-6}\left(TJ/L\right) \times 77.4\left(tCO_2e/TJ\right)}{40.8\left(TJ/year\right)}$$
$= 72.86\ tCO_2e/TJ$

- Sammi Industrial

$BE_{y,\ Sammi\ Industrial} = BE_{y,\ Sammi\ Industrial\_1} + BE_{y,\ Sammi\ Industrial\_2}$
$= 7{,}219\ tCO_2e/year + 144\ tCO_2e/year$
$= 7{,}363\ tCO_2e/year$

$BE_{y,\ Sammi\ Industrial\_1} = EF_{BSL,\ Sammi\ Industrial\_1} \times Q_{y,\ Sammi\ Industrial\_1}$
$= 82.13(tCO_2e/TJ) \times 87.9(TJ/year)$
$= 7{,}219\ tCO_2e/year$

$$EF_{BSL,\ Sammi\ Industrial\_1} = \frac{FC_{BC,Sammi\ Industrial\_1} \times NCV_{BC} \times EF_{CO2,BC}}{Q_{BSL,Sammi\ Industrial\_1}}$$
$$= \frac{2{,}385{,}383\left(L/year\right) \times 39.1 \times 10^{-6}\left(TJ/L\right) \times 77.4\left(tCO_2e/TJ\right)}{87.9\left(TJ/year\right)}$$
$= 82.13\ tCO_2e/TJ$

$BE_{y,\ Sammi\ Industrial\_2} = EF_{BSL,\ Sammi\ Industrial\_2} \times Q_{y,\ Sammi\ Industrial\_2}$
$= 102.77(tCO_2e/TJ) \times 1.4(TJ/year)$
$= 144\ tCO_2e/year$

$$EF_{BSL,\ Sammi\ Industrial\_2} = \frac{FC_{BC,Sammi\ Industrial\_2} \times NCV_{BC} \times EF_{CO2,BC}}{Q_{BSL,Sammi\ Industrial\_2}}$$
$$= \frac{47{,}540\left(L/year\right) \times 39.1 \times 10^{-6}\left(TJ/L\right) \times 77.4\left(tCO_2e/TJ\right)}{1.4\left(TJ/year\right)}$$
$= 102.77\ tCO_2e/TJ$

- Asia Stabilizers

$BE_{y,\ Asia\ Stabilizers} = BE_{y,\ Asia\ Stabilizers\_1}$
$= 6{,}427\ tCO_2e/year$

$BE_{y,\ Asia\ Stabilizers\_1} = EF_{BSL,\ Asia\ Stabilizers\_1} \times Q_{y,\ Asia\ Stabilizers\_1}$

= 90.65(tCO_2e/TJ) × 70.9(TJ/year)
= 6,427 tCO_2e/year

$$EF_{BSL,\ Asia\ Stabilizers\_1} = \frac{FC_{BC,Asia\ Stabilizers\_1} \times NCV_{BC} \times EF_{CO2,BC}}{Q_{BSL,Asia\ Stabilizers\_1}}$$

$$= \frac{2{,}123{,}819\left(^{L}/_{year}\right) \times 39.1 \times 10^{-6}\left(^{TJ}/_{L}\right) \times 77.4\left(^{tCO_2e}/_{TJ}\right)}{70.9\left(^{TJ}/_{year}\right)}$$

= 90.65 tCO_2e/TJ

Company	Baseline Emissions(tCO_2e/year)
Youngjin Chemical	9,431
Sammi Industrial	7,363
Asia Stabilizers	6,427
Total	23,221

Leakage

Leakage is not considered.

Emission Reductions

Company	Baseline Emissions	Project Emissions	Emission reductions
Youngjin Chemical	9,431	6,836	2,595
Sammi Industrial	7,363	5,336	2,027
Asia Stabilizers	6,427	4,659	1,768
Total	23,221	16,831	6,390

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

- Youngjin Chemical Co., Ltd.

Year	Estimation of project activity emissions (tones of CO_2e)	Estimation of baseline emissions (tones of CO_2e)	Estimation of leakage (tones of CO_2e)	Estimation of overall emission reductions (tones of CO_2e)
2010(August~)	2,848	3,929	0	1,081
2011	6,836	9,431	0	2,595
2012	6,836	9,431	0	2,595
2013	6,836	9,431	0	2,595
2014	6,836	9,431	0	2,595
2015	6,836	9,431	0	2,595
2016	6,836	9,431	0	2,595
2017	6,836	9,431	0	2,595
2018(~June)	3,418	4,715	0	1,297
Total	54,118	74,661	0	20,543

- Sammi Industrial Co., Ltd.

Year	Estimation of project activity emissions (tones of CO_2e)	Estimation of baseline emissions (tones of CO_2e)	Estimation of leakage (tones of CO_2e)	Estimation of overall emission reductions (tones of CO_2e)
2010(August~)	2,223	3,067	0	844
2011	5,336	7,363	0	2,027
2012	5,336	7,363	0	2,027
2013	5,336	7,363	0	2,027
2014	5,336	7,363	0	2,027
2015	5,336	7,363	0	2,027
2016	5,336	7,363	0	2,027
2017	5,336	7,363	0	2,027
2018(~June)	2,668	3,681	0	1,013
Total	42,243	58,289	0	16,046

- Asia Stabilizers Co., Ltd.

Year	Estimation of project activity emissions (tones of CO_2e)	Estimation of baseline emissions (tones of CO_2e)	Estimation of leakage (tones of CO_2e)	Estimation of overall emission reductions (tones of CO_2e)
2010(August~)	1,941	2,677	0	736
2011	4,659	6,427	0	1,768
2012	4,659	6,427	0	1,768
2013	4,659	6,427	0	1,768
2014	4,659	6,427	0	1,768
2015	4,659	6,427	0	1,768
2016	4,659	6,427	0	1,768
2017	4,659	6,427	0	1,768
2018(~June)	2,329	3,213	0	884
Total	36,883	50,879	0	13,996

- Grand total Estimation of overall emission reductions of project

Year	Estimation of project activity emissions (tones of CO_2e)	Estimation of baseline emissions (tones of CO_2e)	Estimation of leakage (tones of CO_2e)	Estimation of overall emission reductions (tones of CO_2e)
2010(August~)	7,012	9,673	0	2,661
2011	16,831	23,221	0	6,390
2012	16,831	23,221	0	6,390
2013	16,831	23,221	0	6,390
2014	16,831	23,221	0	6,390
2015	16,831	23,221	0	6,390
2016	16,831	23,221	0	6,390
2017	16,831	23,221	0	6,390
2018(~June)	8,415	11,609	0	3,194
Total	133,244	183,829	0	50,585

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

B.7.1 Data and parameters monitored:

Data / Parameter:	FC_y
Data unit:	m^3/y
Description:	NG consumed by the project in year y
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected	- $FC_{y,\text{Youngjin Chemical\_1}}$: 2,085,808 m^3/y - $FC_{y,\text{Youngjin Chemical\_2}}$: 960,193 m^3/y - $FC_{y,\text{Sammi Industrial\_1}}$: 2,331,712 m^3/y - $FC_{y,\text{Sammi Industrial\_2}}$: 46,470 m^3/y - $FC_{y,\text{Asia Stabilizers\_1}}$: 2,076,033 m^3/y
Description of measurement methods and procedures to be applied:	Monitored periodically by using meters during operation.
QA/QC procedures to be applied:	The meters will be calibrated according to Measures Act. The amount of NG combusted will be double-checked with the receipt of purchase.
Any comment:	

Data / Parameter:	Q_y
Data unit:	TJ/y
Description:	Amount of getting calories by the project boiler using NG after the implementation of the project activity
Source of data to be used:	In this project, Q_{BSL} applied to Q_y.
Value of data applied for the purpose of calculating expected	- $Q_{y,\ Youngjin\ Chemical\_1}$: 32.0 TJ/y - $Q_{y,\ Youngjin\ Chemical\_2}$: 40.8 TJ/y - $Q_{y,\ Sammi\ Industrial\_1}$: 87.9 TJ/y - $Q_{y,\ Sammi\ Industrial\_2}$: 1.4 TJ/y - $Q_{y,\ Asia\ Stabilizers\_1}$: 70.9 TJ/y
Description of measurement methods and procedures to be applied:	Steam meter would be checked, periodically or feed water quantity would be checked and calories by the project boiler would be calculated. In case of the heat medium boiler(Youngjin Chemical boiler 1), product quantity would be checked and calories by the heat medium boiler would be calculated.
QA/QC procedures to be applied:	Data of meters would be recorded by operator by periods. Calories which are calculated by using fuel consumption, and calories which is checked by meters are cross checked.
Any comment:	

B.7.2 Description of the monitoring plan:

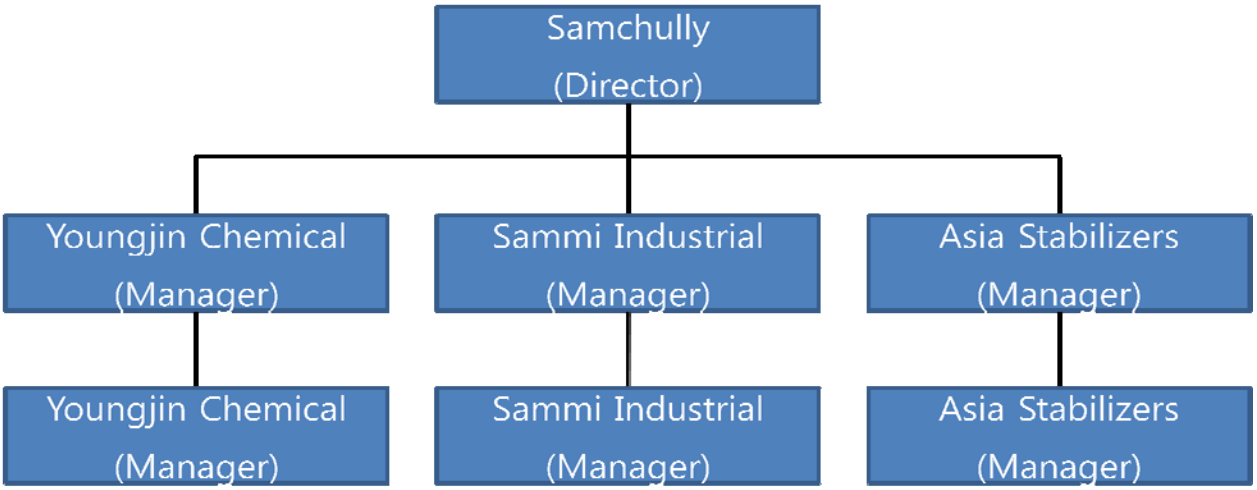
The monitoring demands in the methodology are:

"Monitoring shall involve:

(a) Monitoring of the fossil fuel use and output after the project activity has been implemented – e.g. gas use and heat output by a district heating plant, gas use and electricity generated by a generating unit."

The methodology specifies the parameters needed to be monitored. These are fuel consumption and output for project scenario. These are the parameters to be monitored, stored and used for the purpose of calculating the emission reductions generated by the project.

Samchully has a role for coordinating related tasks between the companies through meeting. Under the plan and coordination, project companies are in charge of measuring and archiving of the above monitoring factors, QA/QC. Each company will assign a manager who will be responsible for monitoring and archiving all data associated with items depicted in the monitoring plan. The monitoring team is composed of a manager and operators. Operators working under the manager will be assigned to the task of monitoring different parameters on a timely basis as well as recording and archiving data in an orderly manner. Monitoring reports will be reviewed by the manager on a monthly basis in order to ensure that the project activity meets all requirements as outlined above.



- Youngjin Chemical Co., Ltd.

The operator reads all fuel meters by periods. In case of steam boiler, the operator reads steam meters by periods or measures feed water quantity and calculates output by heat balance.

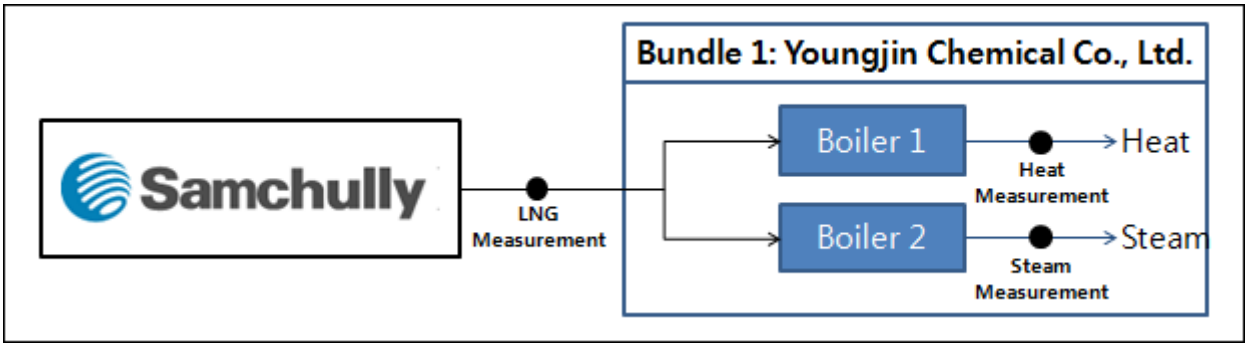
In case of heat medium boiler, the operator checks quantity of the products produced by heat medium boiler and calculates output by heat balance. As the product produced by heat medium boiler is only 98% caustic soda alone, it is rational to calculate heat with heat balance by measuring the quantity of the product. Besides, no other boilers produce 98% caustic soda. In this process, 98% caustic soda is made

from 50% caustic soda by heating. The given enthalpy of 98% caustic soda at 384℃ and 50% caustic soda at 33℃ are 2013.69kJ/kg and 326.02kJ/kg respectively. Relevant evidences about temperature and purity have been submitted to DOE. Heat transferred into the process is equal to subtracting enthalpy of an initial state from that of a final state. Enthalpy of each state should be calculated with consideration of weight of NaOH. As a result of calculation, total heat transfer comes to 1,374,590.8kJ/ton of 98% caustic soda. Output heat can be obtained by multiplying the total heat transfer value and the weight of a final product(98% caustic soda).

Enthalpy (denoted as H) is a thermodynamic property of a thermodynamic system. It can be used to calculate the heat transfer during a process taking place in a closed thermodynamic system. Change in enthalpy ΔH is frequently a more useful value than H itself. For thermodynamic processes, ΔH is equal to the change in the internal energy of the system, plus the work that the system has done on its surroundings. This means that the change in enthalpy is the heat absorbed during the process.

All the collected data is recorded on a sheet of paper and transferred to the electronic system. During this transfer the data is checked by a second operator. If mistakes or discrepancies are detected, a new measurement is done as soon as possible. Periodic measurement is made as an internal control procedure. Data discrepancies can be detected by a simple comparison with measurements made during the previous days.

Samchully will record NG consumption data of Youngjin Chemical because Samchully supplies NG to Youngjin Chemical and charges gas rates. Also, Youngjin Chemical monthly double-checks fuel consumption data which is recorded by Youngjin Chemical on the gas bill from Samchully.



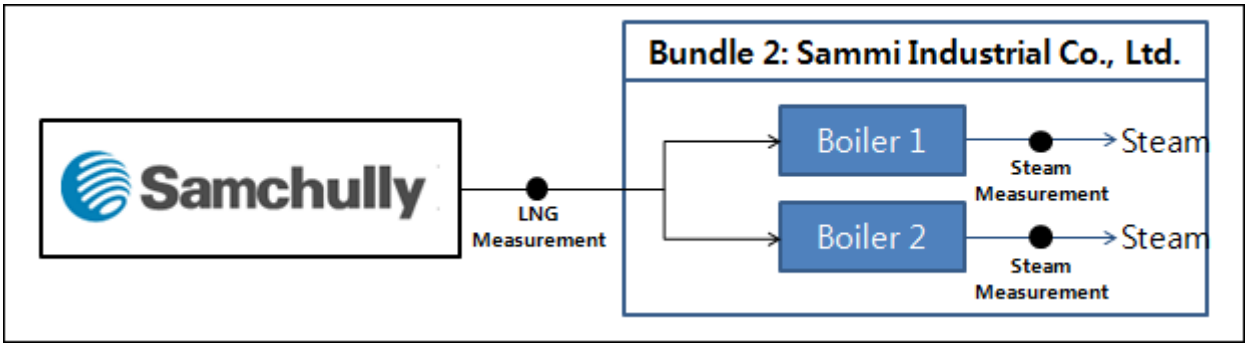
- Sammi Industrial Co., Ltd.

The operator reads all fuel meters by periods. In case of steam boiler, the operator reads steam meters by periods or measures feed water quantity and calculates output by heat balance.

All the collected data are recorded on a sheet of paper and transferred to the electronic system. During this transfer the data is checked by a second operator. If mistakes or discrepancies are detected, a new measurement is done as soon as possible. Periodic measurement is made as an internal control procedure. Data discrepancies can be detected by a simple comparison with measurements made during the previous

days.

Samchully will record NG consumption data of Sammi Industrial because Samchully supplies NG to Sammi Industrial and charges gas rates. Also, Sammi Industrial monthly double-checks fuel consumption data which is recorded by Sammi Industrial on the gas bill from Samchully.

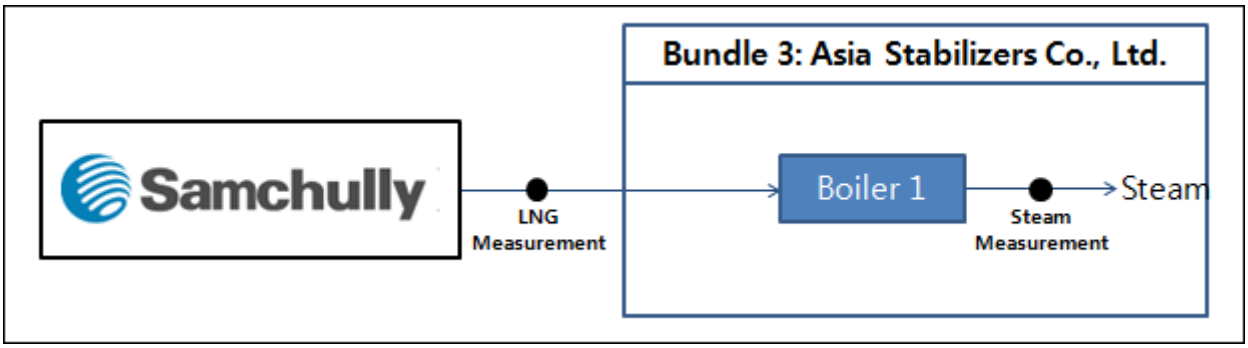


- Asia Stabilizers Co., Ltd.

The operator reads all fuel meters by periods. In case of steam boiler, the operator reads steam meters by periods or measures feed water quantity and calculates output by heat balance.

All the collected data are recorded on a sheet of paper and transferred to the electronic system. During this transfer the data is checked by a second operator. If mistakes or discrepancies are detected, a new measurement is done as soon as possible. Periodic measurement is made as an internal control procedure. Data discrepancies can be detected by a simple comparison with measurements made during the previous days.

Samchully will record NG consumption data of Asia Stabilizers because Samchully supplies NG to Asia Stabilizers and charges gas rates. Also, Asia Stabilizers monthly double-checks fuel consumption data which is recorded by Asia Stabilizers on the gas bill from Samchully.



CDM – Executive Board

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Completion date of the application of the baseline and monitoring methodology: 31/03/2009

The name of the responsible entities

: Samchully Co., Ltd.
: Eco-frontier Co.

Seoul, Republic of Korea

Tel: +82.02.368.3463
Tel: +82.02.3153.7811

Responsible persons

: Kyusan Paek(kspaek@samchully.co.kr)
: Sungkyu Kim(skim@ecofrontier.co.kr)
: Yongsik Choi(yschoi@ecofrontier.co.kr)

CDM – Executive Board

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

- Youngjin Chemical Co., Ltd. : 17/10/2008(Contract for burner purchase and installation)
- Sammi Industrial Co., Ltd. : 03/12/2008(Contract for burner purchase and installation)
- Asia Stabilizers Co., Ltd. : 17/02/2009(Contract for burner purchase and installation)

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

- Youngjin Chemical Co., Ltd. : 25 years
- Sammi Industrial Co., Ltd. : 25 years
- Asia Stabilizers Co., Ltd. : 25 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/04/2010 or the date of registration whichever is later

C.2.2.2. Length:

From the date of registration to 06/07/2018

CDM – Executive Board

SECTION D. Environmental impacts

D.1. If required by the Host Party, documentation on the analysis of the environmental impacts of the project activity:

"Enforcement Decree of the Act on Assessment of Impacts of Works on Environment, Traffic, Disasters, etc." describes projects for which an Environment Impact Assessment (EIA) is required. Under the Act, the proposed project activity does not require the completion of an EIA.

In actual fact, the project activity will help to improve local air quality as well as mitigate climate change. Since the NG will not contain sulphur, it is expected that emissions of SO_x will be reduced by more than 90% compared to the baseline situation (bunker fuel oil C consumption). It is also expected that emissions of NO_x will be reduced by 30 ~ 40 % from the project activity.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Not applicable

CDM – Executive Board

SECTION E. Stakeholder's comments

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

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Stakeholder's comments of the project activity were carried out through a survey by document and by online of Samchully main homepage(http://www.samchully.co.kr).

A survey by document carried out for local stakeholder from 01/02/2009-18/02/2009.

The survey document includes an organized questionnaire of the Clean Development Mechanism, a request of this project, and an official announcement of Samchully to introduce the purpose of this project such as GHG reduction. The translation of question of this survey document is the following:

<Question of survey document>

Promoting Clean Development Mechanism Project

Stakeholder's Comments Survey

1. How much do you know about the climate change issue, Kyoto protocol, and CDM?

2. Do you think that this project contributes to the improvement of the global warming and climate change?

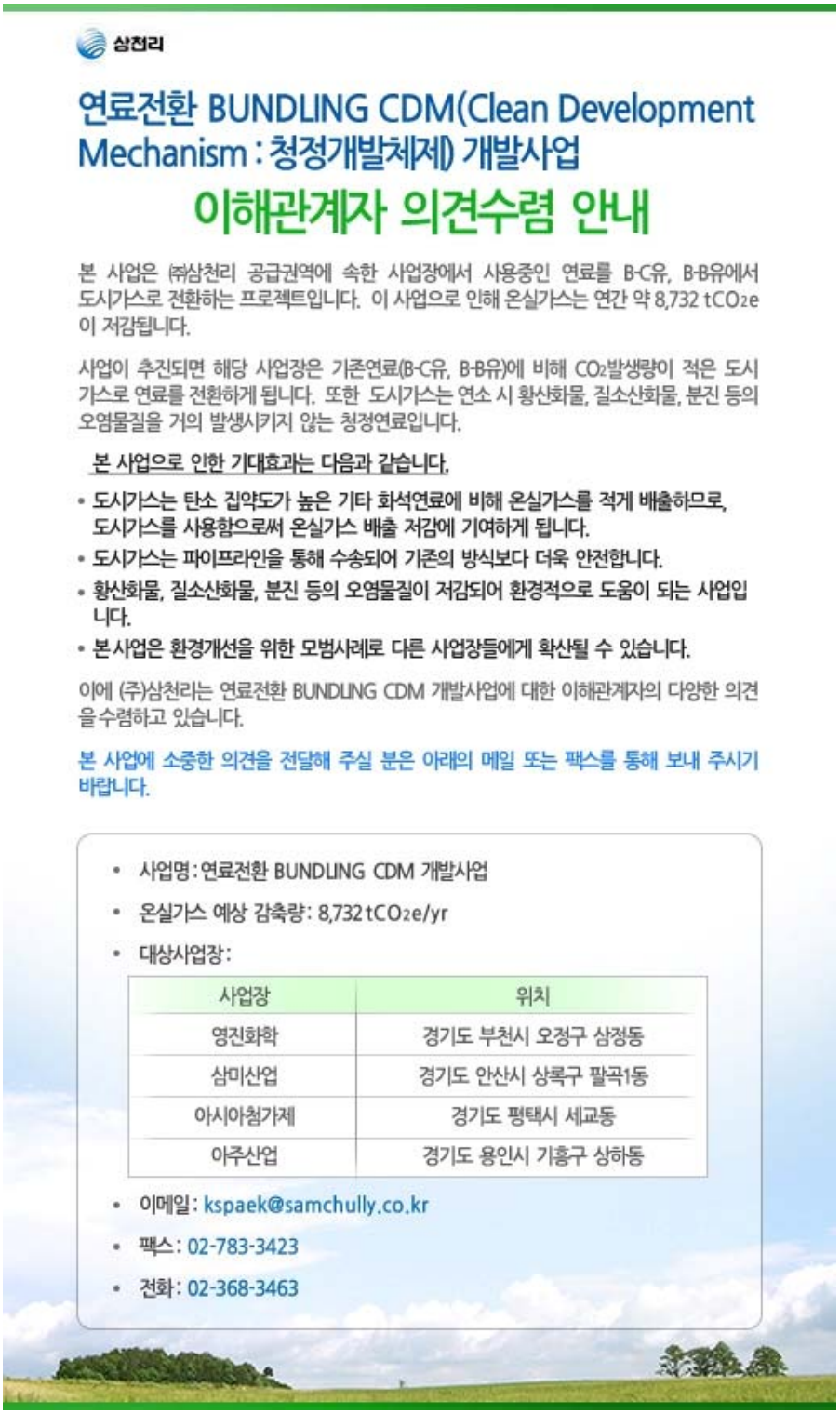
3. What do you think about effect of this project from the viewpoint of the environment?

4. What do you think about effect of this project from the viewpoint of sustainable development?

5. What do you think about effect of this project from the viewpoint of you personally?

6. What is your opinion about this project?

A survey by online of Samchully main homepage carried out for public stakeholder from 27/03/2009-10/04/2009.



삼천리

연료전환 BUNDLING CDM(Clean Development Mechanism : 청정개발체제) 개발사업

이해관계자 의견수렴 안내

본 사업은 ㈜삼천리 공급권역에 속한 사업장에서 사용중인 연료를 B-C유, B-B유에서 도시가스로 전환하는 프로젝트입니다. 이 사업으로 인해 온실가스는 연간 약 8,732 tCO_2e 이 저감됩니다.

사업이 추진되면 해당 사업장은 기존연료(B-C유, B-B유)에 비해 CO_2발생량이 적은 도시가스로 연료를 전환하게 됩니다. 또한 도시가스는 연소 시 황산화물, 질소산화물, 분진 등의 오염물질을 거의 발생시키지 않는 청정연료입니다.

본 사업으로 인한 기대효과는 다음과 같습니다.

- 도시가스는 탄소 집약도가 높은 기타 화석연료에 비해 온실가스를 적게 배출하므로, 도시가스를 사용함으로써 온실가스 배출 저감에 기여하게 됩니다.
- 도시가스는 파이프라인을 통해 수송되어 기존의 방식보다 더욱 안전합니다.
- 황산화물, 질소산화물, 분진 등의 오염물질이 저감되어 환경적으로 도움이 되는 사업입니다.
- 본 사업은 환경개선을 위한 모범사례로 다른 사업장들에게 확산될 수 있습니다.

이에 (주)삼천리는 연료전환 BUNDLING CDM 개발사업에 대한 이해관계자의 다양한 의견을 수렴하고 있습니다.

본 사업에 소중한 의견을 전달해 주실 분은 아래의 메일 또는 팩스를 통해 보내 주시기 바랍니다.

- 사업명 : 연료전환 BUNDLING CDM 개발사업
- 온실가스 예상 감축량 : 8,732 tCO_2e/yr
- 대상사업장 :

사업장	위치
영진화학	경기도 부천시 오정구 삼정동
삼미산업	경기도 안산시 상록구 팔곡1동
아시아첨가제	경기도 평택시 세교동
아주산업	경기도 용인시 기흥구 상하동

- 이메일 : kspaek@samchully.co.kr
- 팩스 : 02-783-3423
- 전화 : 02-368-3463

An official announcement of Samchully introduced the purpose of this project such as GHG reduction. The translation of this official announcement is the following:

<Pop-up message of Samchully>

Promoting Clean Development Mechanism Project

Stakeholder's Comments

This project is developed by Samchully for reducing GHG emissions at three companies in the manufacturing industry.

Through this project, they change the fuel for their facility from bunker fuel oil C to NG.

NG is a clean energy source for combustion. NG combustion has less GHG emission than bunker fuel oil C. Also NG results in less SOx and NOx.

We are taking comments on "Bundled fossil fuel switching to NG(Natural Gas) project in Gyeonggi-do, Republic of Korea".

Please send the comment about this project by e-mail or fax to the address or fax number below.

• Project Title: Bundled fossil fuel switching to NG(Natural Gas) project in Gyeonggi-do, Republic of Korea

Estimated CO_2 emission reductions: about 8,732tCO_2e/yr

• Project Participants

Company	Location
Youngjin Chemical Co., Ltd.	Bucheon City , Gyeonggi-do
Sammi Industrial Co., Ltd.	Ansan City , Gyeonggi-do
Asia Stabilizers Co., Ltd.	Pyeongtaek City, Gyeonggi-do

• E-mail: kspaek@samchully.co.kr

• Fax: 02-783-3423

• Tel: 02-368-3463

E.2. Summary of the comments received:

>>

In general, local stakeholder and residents welcomed the project activity at several survey by document and by online of Samchully main homepage.

They expected that the project activity would reduce greenhouse gases as well as air pollutants - SOx, NOx, dust, particles and contribute local air quality. Some called on continuous management of local air quality after fuel-switching activity.

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

>>

All comments which have been received to this date were very positive for project implementation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Samchully Co., Ltd.
Street/P.O.Box:	35-6, Yeouido-dong
Building:	
City:	Yeongdeungpo-gu
State/Region:	Seoul
Postfix/ZIP:	150-885
Country:	Republic of Korea
Telephone:	+ 82.2.368.3311
FAX:	+ 82.2.782.4198
E-Mail:	you@samchully.co.kr
URL:	www.samchully.co.kr
Represented by:	Un-Sig Hyeon
Title:	General Manager
Salutation:	Mr.
Last Name:	Hyeon
Middle Name:	
First Name:	Un-Sig
Department:	Engineering & Sales Department
Mobile:	+82.19.380.0078
Direct FAX:	+ 82.2.783.3423
Direct tel:	+ 82.2.368.3279
Personal E-Mail:	you@samchully.co.kr

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Project financing will not involve ODA or public funding from any Annex I countries.

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

1. Introduction

The purpose of this Monitoring Plan (MP) is to provide a standard by which each company. Each company will conduct monitoring and verification. The MP shall be in accordance with all relevant rules and regulations of the CDM. The MP is an integral part of this PDD and can be utilized to facilitate accurate and consistent monitoring of the project's Certified Emission Reductions (CERs). Each company will use the MP for the duration of the project activity. The company will strictly follow the MP in order to measure and track the project impacts and prepare for the periodic verification process required to confirm the amount of CERs achieved.

Specifically, the MP facilitates the following;

•Establishing and maintaining a suitable monitoring system
•Guide for the implementation of necessary measurement and management operations
•Guide for meeting CDM requirements for verification and certification

2. Operational and Monitoring Obligations

In order to facilitate accurate CERs determination, the project participant must fulfill a number of operational and data collection obligations. This will ensure that CERs are calculated in a transparent manner and monitoring is carried out as stipulated in the MP. All data required for emission reduction determination shall be monitored as directed in Section B of this PDD.

3. Management and Operational Systems

In order to ensure a successful operation of the project and the credibility and verifiability of the CERs achieved, the project will have a well-defined management and operational system. A system will be put in place for the project and include the operation and management of the monitoring and record keeping system that is described in this MP.

3.1 Allocation of project management responsibilities

The management and operation of the project is the responsibility of each company, the project operator. Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation for the purpose of achieving trustworthy CERs is the key responsibility and accountability of the operator.

3.2 Management and operational systems

The project developers will implement a management and operational system that meets the requirements of the project. This includes:

•Data handling
•Quality assurance
• Training