I. JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM VERSION 01 - IN EFFECT AS OF: 22 October 2007

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

Co-destruction of HFC23 and SF_6 at “KCKK Polimer Plant” Ltd.
Version 1.1
Date: 22 July 2008

A.2. Description of the project:

The project is aimed at destruction of green house gases with high global warming potential (GWP) – HFC23 (CHF_3) and sulfur hexafluoride (SF_6). The global warming potential of HFC23 is 11 700 tonnes of CO_2e per tonne and that of SF_6 is 23 900 tonnes of CO_2e per tonne.

The project is implemented at “KCKK Polimer Plant” Ltd., Kirovo-Chepetsk, Kirov Region, Russia. The plant produces various polymers (including HCFC22 ($CHClF_2$)), monomers, rubbers, fluorocarbons and fluorates.

HFC23 is a by-product of HCFC22 manufacturing. HCFC22 ($CHClF_2$) production line at the Polymers Plant in Kirovo-Chepetsk was put into operation in 1951. The main sources of HFC23 emissions are the HCFC22 condensation and rectification columns. A part of HFC23 is currently captured and recovered for sale, but the market for HFC23 in Russia is limited and cannot consume the total amount of HFC23 produced in the process of HCFC22 manufacturing.

The source of SF_6 emissions is the SF_6 rectification unit. When the by-product (carbon tetrafluoride (CF_4)) is separated by rectification, an insignificant amount of SF_6 (about 2%) escapes with the by-product and is released to the atmosphere through the venting system.

Emissions of SF_6 and HFC23 are currently restricted by the Russian environmental laws, and the plant has the normative (limit) of maximum permissible emissions (MPE) established for each of the emission sources basing on the maximum acceptable concentration of the relevant substances established by the Government (public health standards) and also on the ability of the plant to capture and destroy them. Actually, under current production levels, the entire amount of HFC23 and SF_6 wastes could be emitted to atmosphere without exceeding any public health standards. Nonetheless, as long as the enterprise has some excess FOC destruction capacity it destroys a part of its HFC23 emissions. Destruction of the entire amount of HFC23 in the existing unit is not possible because the plant is required to destroy much more toxic wastes that come from other production lines; this limits the capacity to destroy all HFC23 wastes. SF_6 emissions have never been destroyed at the plant. No Russian legislation is in place requiring SF_6 waste destruction.

The project envisages installation of a thermal hydrolysis unit to destroy fluorine organic compounds (FOC) and a system for purification and neutralization of the waste gases. The thermal unit will be fuelled with hydrogen, which is a by-product of caustic soda production at the plant. The technology has been developed indigenously by the enterprise; the equipment is supplied by a company, which is a part of the Kirovo-Chepetsk Chemical Works Holding. All equipment and technology are certified in compliance with the Russian standards and meet all applicable environmental requirements. The technology is described in detail in Section A.4.2.

The expected results of the project are as follows:

- Destruction of all HFC23 and SF_6 emissions from the stack, as well as reduction of hydrogen emissions;
- Unique experience of SF_6 destruction, which may be further applied by other enterprises in Russia.

The decision to proceed with the project was made taking into account the possibility of deriving revenues from selling the achieved reductions of GHG emissions. The project does not bring any other material benefits to the enterprise and therefore, there are no other incentives for its implementation.

In April 2007, "KCKK Polimer Plant" Ltd. and Camco International signed the Carbon Asset Development Agreement. The design works on the FOC destruction unit started in August 2007. To date all construction works have been completed. Officially the FOC destruction unit has been put into operation on 01 April 2008.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A: Russian Federation (host Party)	Legal entity A1: "KCKK Polimer Plant" Ltd	No
Party B: EU countries	Legal entity B1: Private company CAMCO International Ltd	No

"KCKK Polimer Plant" Ltd is the oldest enterprise in the city. The enterprise was established in 1938. Production of HCFC22 commenced in 1951. At present, "KCKK Polymers Plant" Ltd. employs around 4400 people. The plant manufactures the following products: fluoroplastics, fluorine rubber, fluorocarbons and their mixtures, monomers, perfluorinated gases, lubricating substances and liquids, chlororganic compounds, acids, alkalis and their compounds, gases (oxygen, nitrogen and acetylene), fluoroplastics goods and other consumer goods. The plant's production is unique; some types do not have any counterparts in the world. The plant participates in various exhibitions both in Russia and abroad.

CAMCO International Ltd is a Jersey based-public company founded in 2003, and listed on the AIM of the London Stock Exchange (LSE) in 2006. Camco International is the world leading carbon (greenhouse gas/GHG emission reduction) asset developer under both Joint Implementation (JI) and the Clean Development Mechanism (CDM) of the Kyoto Protocol. Camco's portfolio consists of more than 120 projects, with over 150 Mt CO_2e of GHG reductions contracted in Eastern Europe, Africa, China, and Southeast Asia. The company has been actively operating in Russia since 2005.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Russian Federation

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

Kirov Region

A.4.1.3. City/Town/Community etc.:

The city of Kirovo-Chepetsk

Fig. A.4-1. Location of Kirovo-Chepetsk on the map of Europe

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

Kirovo-Chepetsk is under the jurisdiction of the Region and is the administrative centre of Kirovo-Chepetsk District of Kirov Region. The population as of 2005 stood at 88 300 people. The city is located in Kirov Region of the Volga-Vyatka area, at the confluence of the Chepets and the Vyatka Rivers, 22 km southeast of the city of Kirov.

Geographic latitude: 58°33′N. Geographic longitude: 50°01′E. Time zone: GMT +3:00.

The base of the industrial economy of the city is the Kirovo-Chepetsk Chemical Works named after B.P.Konstantinov, the main employer and largest enterprise in the city.

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

The applied technology was developed indigenously by the enterprise. The equipment is also supplied by a company which is a part of the Kirovo-Chepetsk Chemical Works Holding.

The technology has the following characteristics:

- Excellent burning of fuel to keep high incineration temperatures;
- Design of the burner to ensure good mixing of hot gases and waste;
- Stable and quick gas quenching to minimize dioxins;
- Excellent durability by the application of the highest quality materials.

It should be noted that the polymer plant has relevant experience in this sphere. A unit for thermal destruction of fluorine organic compounds (FOCs) in a hydrogen-air flame was installed, and has been successfully operated, since 1980-s. The unit is designed for thermal oxidative hydrolysis of liquid and gaseous wastes of fluoro-olefins production (tetrafluoroethylene, hexafluoropropylene, trifluorochloroethylen, difluoroethylene). All equipment and technology are certified in compliance with Russian federal (national) standards and meet all applicable environmental requirements. However, the existing unit can destroy only a part of HFC23, since it is currently utilized to destroy other substances, which are more toxic compared to HFC23. SF_6 has never been previously destoryed.

In the process of HCFC22 production, the two principal by-products are generated, namely HFC23 and HCFC21. However, HCFC21 can be returned to the production cycle, whereas HFC23 is associated with unrecoverable losses of raw materials. Therefore, the enterprise undertook some measures to reduce the HFC23 generation ratio. With HCFC22 output of between 13 and 18 thousand tonnes, HFC23 generation ratio was at 1.06 to 1.59% of HCFC22 output by weight. In 2006, HCFC22 output amounted to 16 488 tonnes, with HFC23 output being 231.9 tonnes. Of this, 14.2 tonnes of HFC23 were sold (this was the highest sales in plant's history), 134.0 tonnes were decomposed (destroyed) by thermal oxidation, and the remaining 83.7 tonnes were released to the atmosphere.

The Company decided to invest in a new unit to destroy all waste HFC23 on the assumption that it would obtain emission reduction credits ("carbon finance") for voluntarily destroying the HFC23 that was not required by local environmental regulations (Note: The plant has never exceeded emission levels above local regulatory requirements).

The project involves collection and supply to the new thermal destruction unit of the entire amount of waste HFC23 from stationary sources of Shops No.76 and No.22 (including HFC23, which is currently destroyed in the existing thermal destruction unit), as well as the SF_6 waste flow from the SF_6 rectification column of Shop No.2. The main source of HFC23 emissions in Shop No.76 is the HCFC22 condensation and rectification unit. The source of HFC23 emissions in Shop No.22 is the line of commercial production of HFC23.

The waste HFC23 stream has the following composition:

Inert substances –23% by volume
CO_2 – 1% by volume
HFC23 – 72% by volume
HCFC22 – 3% by volume

The waste flow from SF_6 rectification column has the following composition:

Inert substances – 54.0% by volume
SF_6 – 45.5% by volume
CF_4 – 0.5% by volume

Hydrogen and air, with an excess factor with a stoichiometric coefficient of 1.1 to 1.2, will be fed together with wastes, to the new thermal destruction unit. The unit will provide for thermal-oxidative hydrolysis of wastes as per the following main chemical reactions:

$$H_2 + \frac{1}{2} O_2 \rightarrow H_2O$$

$$CHF_3 + 0.5O_2 + H_2O \rightarrow CO_2 + 3HF$$

$$CHClF_2 + 0.5O_2 + H_2O \rightarrow CO_2 + HCl + 2HF$$

$$SF_6 + 3H_2O \rightarrow SO_2 + 6HF + \frac{1}{2} O_2$$

$$CF_4 + 2H_2O \rightarrow CO_2 + 4HF$$

As a result of thermal-oxidative hydrolysis, fluorocarbons are destroyed and carbon dioxide, hydrogen chloride and hydrogen fluoride are produced. In the hydrolysis of SF_6, hydrogen fluoride and sulphur dioxide are produced. The required temperature is ensured by the combustion of hydrogen.

The process flow diagram of the unit is shown in Fig. A.4-2.

The thermal decomposition unit (3_3) is a vertical cone-shaped aggregate made of thermal and corrosion resistant steel with a special burner at the bottom, to which gaseous wastes, hydrogen and air are fed. Gaseous wastes are fed via the inner tube of the burner, hydrogen is fed via the inner ring, and air is fed via the outer ring.

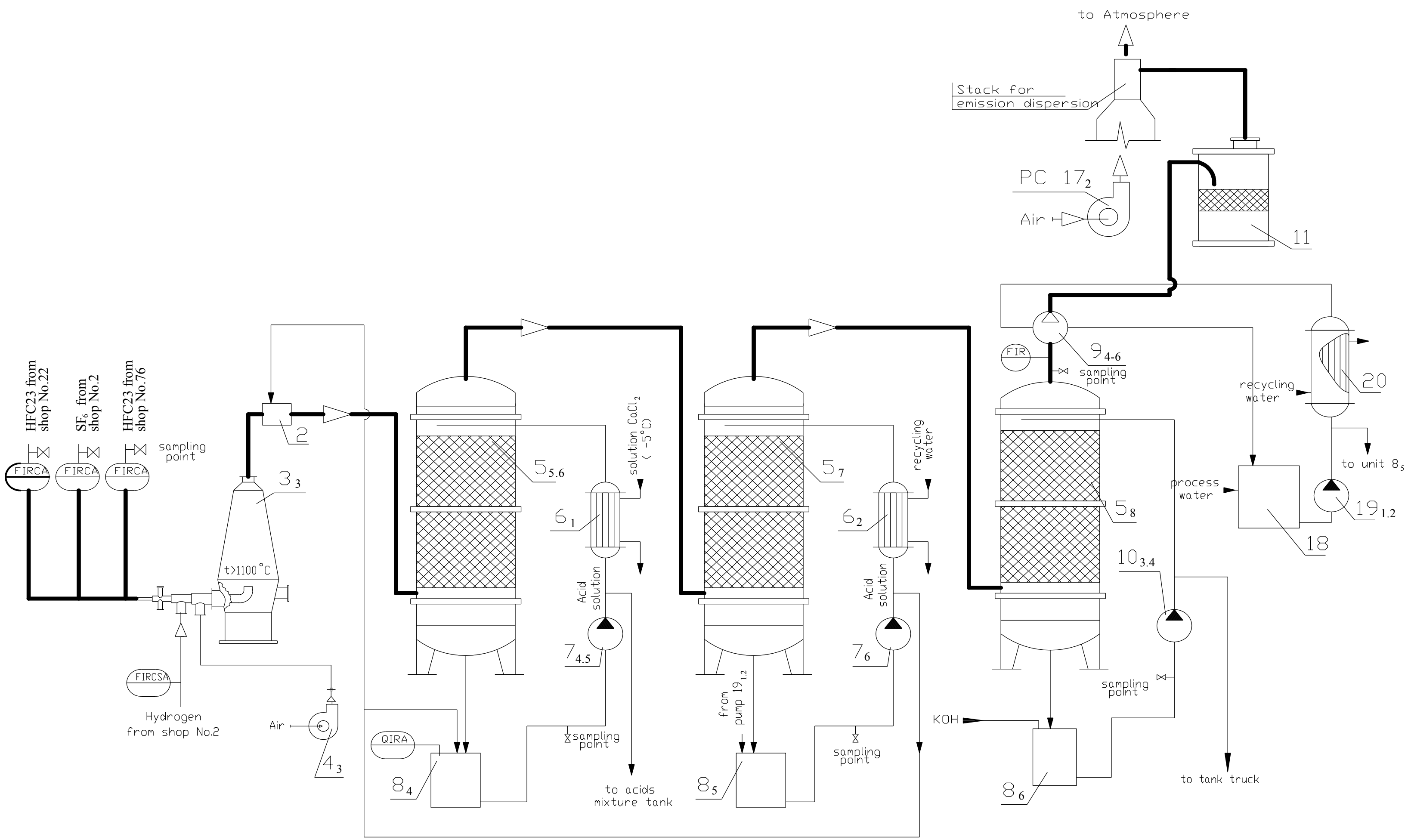

Fig. A.4-2. The process flow diagram of the FOC decomposition unit

Hydrogen is fed to the burner from chlorine and caustic soda production Shop No.82 via an interconnecting pipeline fitted with an electric bolt, and with shut-off and control valves. Atmospheric air is supplied to the burner by a forced draft fan (4_3).

The temperature in the furnace is maintained within the range of 1100-1300 ^{0}C. When the temperature falls below 1100 ^{0}C, or in case of furnace shutdown (flame-out), and under minimum alkali charge to the column (5_8), the supply of wastes to the unit is halted.

The combustion products after the furnace (3_3) through a quench (2), with the maximum temperature of 150^{0}C, are fed to absorption purifiers from acidic impurities (columns $5_{5,6}$, $5_{7,8}$). The combustion products are transported by means of a vacuum created by a vacuum-pump (9_{4-6}), installed after the absorption purification system.

The absorption columns ($5_{5,6}$), one of which is a stand by column, serve to capture the bulk of hydrogen chloride and hydrogen fluoride with output of a commercial mixture of hydrofluoric and hydrochloric acids. The columns are sprayed ($5_{5,6}$) by a pump ($7_{4,5}$) with circulating solution of an acids mixture from a circulation tank (8_4) via a heat exchanger (6_1). When the target concentration is achieved, the solution of hydrofluoric and hydrochloric acids is pumped to a collecting tank, from which it is loaded into railway tanks and dispatched to customers. The system is replenished with the spraying liquid by means of circulating solution of the column (5_7), and if necessary with process water.

The gas from the column ($5_{5,6}$), partially purified from impurities of hydrogen chloride and hydrogen fluoride, is supplied to the absorption column (5_7), which is sprayed by a pump (7_6) with a solution of the mixture of hydrofluoric and hydrochloric acids circulating through a heat exchanger (6_2). The produced mixture of acids with HF concentration of not more than 5% is fed to the quench (2) and to a circulation tank (8_4) for make-up of the circulating solution of the absorption column ($5_{5,6}$). The circulating solution of the absorption column (5_7) is replenished with water from the collecting tank (18), and if necessary with process water.

The sanitary purification column (5_8) is sprayed with a 10% solution of potassium hydroxide. Spraying is done by a pump ($10_{3,4}$) from a circulation tank (8_6). When the alkaline solution concentration weakens to 1.0% it is pumped from the discharge line of the pump ($10_{3,4}$) to road-tankers and further dispatched to the mineral fertilizers plant to be used as a potassium additive in production of mineral fertilizers. The circulation tank (8_6) is refilled with fresh alkaline solution.

The neutralized gases from the sanitary purification column (5_8) are pumped by a vacuum pump (9_{4-6}) via an entrainment trap (11) to a venting stack, where they are mixed with air forced from a fan (17_2) and emitted to the atmosphere.

The liquid which creates a water ring in the vacuum pump (9_{4-6}) is circulating in a closed-cycle: collecting tank (18) – centrifugal pump ($19_{1,2}$) – chiller (20) – vacuum pump (9_{4-6}) – collecting tank (18). The collecting tank (18) is filled with process water. As the need arises the water from the collecting tank (18) by a centrifugal pump ($19_{1,2}$) is pumped to the circulation tank (8_5).

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The project envisages utilization of almost total amount of waste HFC23 and SF_6, which before the project have been emitted to the atmosphere. Taking into account the high GWP values of these gases, the project will result in significant reduction of adverse anthropogenic impact upon climate system, i.e. in reduction of GHG emissions measured in tonnes of CO_2 equivalent.

The plant has the approved level of MPE for all sources of HFC23 and SF_6. Currently the plant emits the entire quantity of SF_6-containing wastes and a considerable amount of HFC23. The enterprise has some excess FOC destruction capacity and therefore destroys some of its HFC23 wastes. However it is not possible to destroy the entire amount of wastes in the existing unit. Under the current levels of HCFC22 production the entire amount of emissions from the rectification column could be emitted to atmosphere without exceeding the public health standards set for HFC23.

Furthermore, some amount of HFC23 is recovered for sale; however its market in Russia is limited and cannot consume the entire quantity of HFC23 produced in manufacturing of HCFC22. Sales of HFC23 as a commercial commodity are small.

Without the JI project implementation, the plant would have continued to release HFC23 and SF_6 to the atmosphere in accordance with the existing practice, which is based on the following:

1. The environmental standards of the Russian Federation do not require complete destruction of HFC23 and SF_6. These waste gases are ranked as the 4th hazard class, i.e. they are considered virtually harmless for the environment and human health.
2. HFC23 and SF_6 are green house gases and are characterized by high global warming potential (GWP). However no limitations of GHG emissions are set for industrial enterprises in Russia so far and those are not expected at least until 2012.
3. HFC23 and SF_6 destruction process entails significant capital and operating costs, but brings no material economic benefits other than potential income from selling GHG emission reductions in the carbon market under the flexible mechanisms of the Kyoto Protocol.
4. It would not be possible to destroy the entire volume of HFC23 in the existing unit, since many other waste products are currently destroyed in it that are far more toxic than HFC23, i.e. gaseous organic fluorochlorine residues from manufacturing of tetrafluoroethylene, hexafluoropropylene and its derivatives, trifluorochloroethylene, chlorodifluoroethane (HCFC142), difluoroethylene, fluoroplastics and fluorine rubber, and the priority is obviously given to the destruction of these highly toxic substances.
5. Even though HFC23 and SF_6 emissions are restricted in Russia, fines or other payments are not set for emissions of these substances.

The project is not a common practice in Russia. Typically, a plant which has an established limit for emission of the waste gases (MPE) is not interested in complete destruction of these wastes. According to the existing practice, manufacturers of HCFC22 release HFC23 to the atmosphere without violating any Russian environmental standards.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	786 167
2009	1 048 186
2010	1 048 139
2011	1 048 102
2012	1 048 081
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	4 978 675
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	995 735

A.5. Project approval by the Parties involved:

The letters of approval from the Parties will be received later.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

Methodological approach

The methodological approach in relation to this project is based on the approved CDM methodology *AM0001/Version 05.1* "*Incineration of HFC23 waste streams",* in effect since December 22, 2006 and up to now.

All applicability conditions of the methodology relating to HFC23 destruction are met:

- The project involves destruction of HFC23 waste streams from the existing HCFC22 production facility at "KCKK Polimer Plant" Ltd.;
- HCFC22 production facility was launched in 1951, and was in operation between 2000 and 2004 and from 2005 until now;
- HFC23 destruction unit will be located on the territory of "KCKK Polimer Plant" Ltd.;
- Russian laws and regulations do not require destroying of the total amount of waste HFC23.

Still it appeared necessary:

(1) – to extend the methodology so as to include SF_6, since the project envisages combined thermal destruction of HFC23 and SF_6; and

(2) – to refine the methodology in relation to the determination of the baseline quantity of waste gases destroyed to provide for specific features of emissions regulation in the Russian Federation.

Further these aspects are considered in detail.

When AM0001 methodology is extended to cover SF_6, the formula for emission reductions calculation[1] turns as follows:

$$\begin{aligned} ER_y = &(Q\_HFC23_y - B\_HFC23_y) \times GWP\_HFC23 + \\ &+ (Q\_SF_{6y} - B\_SF_{6y}) \times GWP\_SF_6 - E\_DP_y - L_y \end{aligned}, \qquad \text{(B.1-1)}$$

Where ER_y is total GHG emission reduction under the project during the year y, t CO_2-e;

Q_HFC23_y is the quantity of HFC23 destroyed under the project during the year y, t;

Q_SF_{6y} is the quantity of SF_6 destroyed under the project during the year y, t;

B_HFC23_y is the baseline quantity of HFC23 destroyed during the year y, т;

B_SF_{6y} is the baseline amount of SF_6 destroyed during the year y, т;

GWP_HFC23 is the Global Warming Potential (GWP) to convert 1 tonne of HFC23 to tonnes of CO_2 equivalent, t CO_2-e/t. The approved GWP value for HFC -23 is 11 700 tonnes of CO_2-e/t for the first commitment period under the Kyoto Period;

GWP_SF_6 is the Global Warming Potential (GWP) to convert 1 tonne of SF_6 to tonnes of CO_2 equivalent, t CO_2-e/t. The approved GWP value for SF_6 is 23 900 tonnes of CO_2-e/t for the first commitment period under the Kyoto Period;

[1] The original formula (1) of CDM methodology AM0001/Version 05.1

E_DP_y is GHG emission from destruction process during the year y, t CO_2-e;

L_y is the leakage of GHG emissions which is a sum of GHG emissions due to the project activity that occur outside the project boundary during the year y, t CO_2-e.

Q_HFC23_y and Q_SF_{6y} values are subject to thorough monitoring. Furthermore, the mass balance equations are to be observed, which for the project scenario are as follows:

$$G\_HFC23_y = Q\_HFC23_y + S\_HFC23_y + L\_HFC23_y, \quad \text{(B.1-2)}$$

$$G\_SF_{6y} = Q\_SF_{6y} + L\_SF_{6y}, \quad \text{(B.1-3)}$$

Where G_HFC23_y is the amount of HFC23 generated in production of HCFC22 during the year y, t;

G_SF_{6y} is the amount of SF_6 contained in the waste flow from the rectification column of SF_6 production during the year y, t;

S_HFC23_y is the amount of HFC23 recovered for sale during the year y, t;[2]

L_HFC23_y is the amount of HFC23 leaks to the atmosphere inside the project boundary during the year y, t;

L_SF_{6y} is the amount of SF_6 leaks to the atmosphere inside the project boundary during the year y, t.

G_HFC23_y and G_SF_{6y} values will be monitored.

The amount of HFC23 recovered for sale does not depend on the project and is assumed equal for the project and for the baseline. The value of S_HFC23_y will be monitored.

In estimations it is acceptable to assume that HFC23 and SF_6 leaks to the atmosphere are equal to zero. During monitoring they will be determined by the difference between the readings of the meters, which measure generation and destruction of substances less HFC23 recovered for sale.

In accordance with AM0001/Version 05.1 methodology, to exclude the possibility of manipulating the production process to increase the quantity of waste, the following *cut-off conditions* are set:

$$G\_HFC23_y \le MIN\left\{P\_HCFC22_y;\ P\_HCFC22_{Hist,\max}\right\} \times w_h, \quad \text{(B.1-4)}$$

$$G\_SF_{6y} \le MIN\left\{P\_SF_{6y};\ P\_SF_{6Hist,\max}\right\} \times w_s, \quad \text{(B.1-5)}$$

Where P_HCFC22_y is the actual (as monitored) or planned (as projected) production of HCFC22 at "KCKK Polymers Plant" Ltd. during the year y, t;

P_SF_{6y} is the actual (as monitored) or planned (as projected) production of saleable SF_6 at "KCKK Polymers Plant" Ltd. during the year y, t;

$P\_HCFC22_{Hist,\max}$ is the actual maximum annual production of HCFC22 at the plant over a historical period[3], t. For $P\_HCFC22_{Hist,\max}$ we take the maximum annual volume of HCFC22 production at "KCKK Polymers Plant" Ltd. over 2002-2004;

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[2] SF_6 waste flow from rectification column can not be regarded as a commercial commodity.

$P\_SF_{6Hist,\max}$ is the actual maximum annual production of saleable SF_6 at the plant over a historical period, t. For $P\_SF_{6Hist,\max}$ we take the maximum annual production of saleable SF_6 at "KCKK Polymers Plant" Ltd. over 2002-2004;

w_h is HFC23 generation rate per unit production of HCFC22. For w_h we assume its minimum average annual value according to actual data of "KCKK Polymers Plant" Ltd. over 2002-2004[4];

w_s is the fraction of SF_6 in the waste flow from SF_6 rectification column per unit production of saleable SF_6. For w_s we assume its minimum average annual value according to actual data of "KCKK Polymers Plant" Ltd. over 2002-2004.

According to AM0001/Version 05.1 methodology, the quantity of HFC23 destroyed under the baseline is equal to the quantity of the HFC23 waste stream required to be destroyed by applicable regulations.

If the project envisages destruction of the total amount of HFC23 waste generated, the methodology prescribes to calculate the baseline quantity of HFC23 destroyed measured in tonnes during the year *y* as follows[5]:

$$B\_HFC23_y = Q\_HFC23_y \times r_y , \qquad (*)$$

Where r_y is the fraction of HFC23 waste required to be destroyed by applicable regulations during the year *y*.

However, the procedure for state regulation of harmful emissions, including HFC23 emissions, is essentially different in Russia. The Russian environmental law does not specify the fraction of HFC23 waste which is required to be recovered and destroyed (r_y), instead it specifies the amount of HFC23 emissions to the atmosphere in absolute number. This index is called the "specified level of maximum permissible emissions", or MPE.

It is worth elaborating on this issue a bit more. The principal legal instrument that regulates emission of pollutants by the emitters is the Federal Law N 96-FZ "On Air Protection" dated 4 May 1999. According to the law, pollutant emissions to the atmosphere from the stationary sources are only permitted if the emitter has an official "Permit for emission of pollutants". This permit is issued if the emitter has a special document, "MPE Volume", which is prepared by the emitter and submitted for approval to the environmental agency at least once in every five years. This document justifies the expected levels of MPE per unit time (g/s, t/y) stated by the emitter for each of its stationary sources and for each pollutant.

The first and the main condition in setting the MPE level for the source is that *the maximum permissible ground level concentration (MPC)* of the pollutant at the boundary of the plant's sanitary protection zone with allowance for background concentration should not be exceeded. Emissions dispersion modeling is employed to check if this condition is met.

Alongside with this, in setting the MPE level for a specific year it is necessary to take into account the reporting data on inventory of actual emissions for the previous period, and whether the emitter has necessary equipment and technology for recovery and destruction of pollutants, as well as production development plans and expected output for the forthcoming period. For the newly commissioned facilities, the specified level of MPE is set on the basis of the design documentation.

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[3] According to AM0001/Version 05.1 methodology, the historical period is any of the last three years between the beginning of 2000 and the end of 2004.

[4] Not exceeding 3%, which is in compliance with AM0001/Version 05.1 methodology.

[5] Formula (4) of CDM methodology - AM0001/Version 05.1

If the expected level of emissions applied for by the emitter meets the requirements of MPC, then they are normally approved as the specified level of MPE for this enterprise.

In some cases, instead of the specified level of MPE, a temporary limit is set for the emitter, which is called the “limit of temporary approved emissions”. This is done when the emissions exceed the maximum acceptable level meeting the MPC in which case emitter is obliged to implement, under the supervision of the environmental authorities and within the time limit agreed with the environmental authorities, all necessary measures to reduce its emissions to the level meeting the MPC requirement.

“KCKK Polymers Plant” Ltd. is on the safe side in meeting the maximum permissible concentration of emissions for both HFC23 and SF_6. This means that the plant is not required to reduce emissions of HFC23 and SF_6 and, according to the Russian regulations, does not have to undertake any commitments to do so. Furthermore, if the technology changes and/or the output increases, higher levels of MPE[6] might be set for the plant both for HFC23 and SF_6 sources.

On the opposite to that, implementation of the GHG emission reduction project at “KCKK Polimer Plant” Ltd., which involves destruction of almost entire quantity of HFC23 and SF_6 waste, will cause the MPE levels for these pollutants to be lowered.

As follows from the above, the specified level of MPE for the sources under consideration cannot be, generally speaking, considered as a basis for determination of the baseline quantity of wastes required to be destroyed by applicable regulations. Such basis may and should be the maximum possible levels of HFC23 and SF_6 emissions, which meet the specified values of MPC at the boundary of sanitary protection zone, because MPC is an objective and fixed parameter which is set by applicable regulations, whereas MPE are set as agreed on the basis of an application submitted by the emitter taking into account various factors including technology applied, plans of production development, as well as voluntary obligations by the emitter to recover and destroy harmful emissions.

However, following the conservative approach, for the baseline scenario we assume that “KCKK Polimer Plant” Ltd. would have continued to release HFC23 and SF_6 in the same amounts as before the project, and that the specified levels of MPE would not have been reconsidered and raised at least until 2012. For this reason and also following the conservative approach, B_HFC23_y and B_SF_{6y} for this project were determined on the basis of the lowest historical values of the corresponding MPE levels, set forth for “KCKK Polimer Plant” Ltd. in 2002-2004.

In view of the above stated and taking into account that some amount of HFC23 is recovered for sale, it is proposed to determine the baseline quantity, B_HFC23_y and B_SF_{6y}, on the basis of mass balances of generated HFC23 and SF_6 wastes as shown below.

The baseline quantity of HFC23 destroyed during the year y measured in tonnes is determined as follows:

$$B\_HFC23_y = G\_HFC23_y - S\_HFC23_y - MPE\_HFC23_{Hist,\min}, \qquad \text{(B.1-6)}$$

Where $MPE\_HFC23_{Hist,\min}$ is the minimum level of maximum permissible emissions of HFC23 from the sources within the project boundary (condensation and rectification column of HCFC22 production

[6] According to Russian regulations the destroyed substances are considered to be of low hazard: 4th class of hazard; $MPC_{max.one\text{-}time}$ (maximum one-time maximum permissible concentration) in the operation zone and TSEL (tentative safe exposure level) in air in a populated area for HFC23 and SF_6 are 3000 and 5000 mg/m^3, and 10 and 20 mg/m^3, respectively. Actual concentrations of these substances at the boundary of the sanitary protection zone and at monitoring points of the residential area do not exceed 0.03 and 0.01 parts of MPC, respectively.

line and rectification column of saleable HFC23 production line) during the year according to historical data (2002-2004)[7], t.

The value of B_HFC23_y can not be negative, therefore if the difference of generated and saleable HFC23 is equal or less than the assumed historical MPE, the enterprise can without any obstacles release the total amount of the remaining HFC23 to the atmosphere and does not have to destroy any of it. Therefore:

$$\text{if } G\_HFC23_y - S\_HFC23_y \leq MPE\_HFC23_{Hist,\min}\text{, then } B\_HFC23_y = 0. \qquad \text{(B.1-7)}$$

The above stated is also true for SF_6 apart from the fact that waste SF_6 can not be sold as a commercial commodity. Similar formulae for waste SF_6 are as follows:

$$B\_SF_{6y} = G\_SF_{6y} - MPE\_SF_{6Hist,\min}, \qquad \text{(B.1-8)}$$

$$\text{if } G\_SF_{6y} \leq MPE\_SF_{6Hist,\min}\text{, then } B\_SF_{6y} = 0.^{8} \qquad \text{(B.1-9)}$$

Where $MPE\_SF_{6Hist,\min}$ - is the minimum level of maximum permissible emissions of SF_6 from the sources within the project boundary (SF_6 rectification column) during the year according to historical data (2002-2004), t.

GHG emissions from combined thermal destruction of HFC23 and SF_6 during the year y are calculated using the following formula[9], t CO_2-e:

$$E\_DP_y = ND\_HFC23_y \times GWP\_HFC23 + ND\_SF_{6y} \times GWP\_SF_6 + Q\_HFC23_y \times EF, \qquad \text{(B.1-10)}$$

Where ND_HFC23_y is the quantity of HFC23 not destroyed during the year y, t;

ND_SF_{6y} is the quantity of SF_6 not destroyed in the unit during the year y, t;

EF is the emissions factor which determines the amount of CO_2 per 1 tonne of destroyed HFC23. According to CDM methodology AM0001, EF = 0.62857 t CO_2-e/t.

The values of ND_HFC23_y and ND_SF_{6y} will be monitored under the project. For estimations it is acceptable to assume that their fractions do not exceed 0.01% of Q_HFC23_y and Q_SF_{6y} respectively.

It should be noted that the unit will be fired not with fossil fuel but with hydrogen, which is a by-product of caustic soda production at the same plant. Therefore the member which accounts for CO_2 emissions from fossil fuel combustion is missing in the formula (B.1-10). The project will not have any impact upon hydrogen output and, therefore, it will not influence emissions due to its production.

Significant GHG leakages due to the project activity that occur outside the project boundary are only CO_2 emissions due to electricity consumption by the new FOC thermal destruction unit[10]. These leakages are calculated as follows, t CO_2:

[7] In 2002-2004 the specified levels of MPE for HFC23 and SF_6 at "KCKK Polymers Plant" Ltd. remained unchanged.

[8] It should be noted that during the historical period the condition (B.1-9) was met.

[9] Original formula (2) of CDM methodology - AM0001/Version 05.1

$$L_y = EC_y \times EF_{CO2,grid,y} \times 10^{-3},\qquad \text{(B.1-11)}$$

Where EC_y is electricity consumption for destruction process during the year y, MWh;

$EF_{CO2,grid,y}$ is CO_2 emissions factor for grid electricity consumption during the year y, kg CO_2/MWh.

Electricity consumption will be controlled by electric meter. In our projections electricity consumption is estimated using specific consumption norms per tonne of destroyed substance:

$$EC_y = ec \times (Q\_HFC23_y + Q\_SF_{6y}),\qquad \text{(B.1-12)}$$

Where ec is specific norm of electricity consumption per tonne of destroyed substance, kWh/t. According to the data provided by the enterprise ec =1100 kWh/t.

According to the *Guidelines for Project Design Documents of Joint Implementation Projects. Volume 1. General guidelines. Version 2.3. Ministry of Economic Affairs of the Netherlands. May 2004,* GHG emissions factor for grid electricity consumed in Russia depending on the year under consideration (2008-2012) is as follows: $EF_{CO2,grid,2008}$ = 565 kg CO_2/MWh, $EF_{CO2,grid,2009}$ = 557 kg CO_2/MWh, $EF_{CO2,grid,2010}$ = 550 kg CO_2/MWh, $EF_{CO2,grid,2011}$ = 542 kg CO_2/MWh, $EF_{CO2,grid,2012}$ = 534 kg CO_2/MWh.

It is necessary to note that for calculation of the project emissions and GHG leakages the values of Q_HFC23_y and Q_SF_{6y} should be taken without limitations set by conditions (B.1-4) and (B.1-5).

The outlined model built upon AM0001/Version 05.1 methodology allows to make correct calculations of GHG emissions reductions achieved due to the project.

Key factors which determine GHG emission reductions

Table B.1-1 shows all input data, as well as results of intermediate calculations based on the above formulae, which are needed to calculate GHG emissions.

Actual figures according to the data provided by “KCKK Polimer Plant” Ltd. are given for the period from 2002 till 2006. The projected levels of HCFC22 and SF_6 production for the period up to 2012 correspond to the production plans of the plant. The projected production level of saleable HFC23 is assumed at 15 tonnes per year, which is somewhat higher than in 2006. It should be noted that this parameter does not influence the level of GHG emission reductions, since it is very small.

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[10] The unit operation does not require steam. Leakages due to transport of the mixture of acids are negligibly small (See estimations in Section B.3).

Table B.1-1. Data needed for calculation of GHG emission reductions

Designation	Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
P_HCFC22_y	t	13 135.4	10 562.7	16 956.5	18 116.9	16 488.0	19 077.0	19 633.0	20 856.0	22 360.0	23 616.0	24 398.0
$P\_HCFC22_{Hist,\max}$	t							16 956.5	16 956.5	16 956.5	16 956.5	16 956.5
$*G\_HFC23_y$	t	172.1	167.9	180.1	209.2	231.9	202.6	208.5	221.5	237.5	250.8	259.1
G_HFC23_y	t							180.1	180.1	180.1	180.1	180.1
Q_HFC23_y	t							165.1	165.1	165.1	165.1	165.1
S_HFC23_y	t	2.6	0.0	3.5	9.7	14.2	15.0	15.0	15.0	15.0	15.0	15.0
L_HFC23_y	t							0.0	0.0	0.0	0.0	0.0
B_HFC23_y	t							81.7	81.7	81.7	81.7	81.7
$MPE\_HFC23_{Hist,\min}$	t	83.4	83.4	83.4	83.4	83.4	83.4	83.4	83.4	83.4	83.4	83.4
ND_HFC23_y	t							0.0194	0.0207	0.0222	0.0236	0.0244
w_h	%	1.31%	1.59%	1.06%	1.15%	1.41%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%
P_SF_{6y}	t	157.80	158.20	219.90	390.60	448.60	710.0	700.0	700.0	700.0	700.0	700.0
$P\_SF_{6Hist,\max}$	t							219.9	219.9	219.9	219.9	219.9
$*G\_SF_{6y}$	t	2.21	4.82	5.01	5.25	5.80	9.9	9.8	9.8	9.8	9.8	9.8
G_SF_{6y}	t							3.1	3.1	3.1	3.1	3.1
Q_SF_{6y}	t							3.1	3.1	3.1	3.1	3.1
L_SF_{6y}	t							0.0	0.0	0.0	0.0	0.0
B_SF_{6y}	t							0.0	0.0	0.0	0.0	0.0
$MPE\_SF_{6Hist,\min}$	t	6.02	6.02	6.02	6.02	6.02	6.02	6.02	6.02	6.02	6.02	6.02
ND_SF_{6y}	t							0.0010	0.0010	0.0010	0.0010	0.0010
w_s	%	1.40%	3.04%	2.28%	1.34%	1.29%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%
ec	kWh/t							2 500	2 500	2 500	2 500	2 500
EC_y	MWh							508	541	581	614	635
$EF_{CO2,grid,y}$	kg CO_2/MWh	612	604	596	588	581	573	565	557	550	542	534

* - values were determined without applying conditions (B.1-4) and (B.1-5)

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Analysis of the alternatives and the chosen baseline scenario

The baseline scenario was chosen on the basis of AM0001/Version 05.1 methodology and on the basis of the below analysis of the project alternatives, including the project activity as not JI:

Alternative 1: Continuation of the existing situation;

Alternative 2: Destruction of the total volume of HFC23 and SF_6 in the existing unit for thermal destruction of FOC;

Alternative 3: Sale of HFC23 and SF_6 as commercial commodities;

Alternative 4: The project activity as not JI.

Each of the alternatives is considered in detail below.

Alternative 1: Continuation of the existing situation

To date, the plant releases around 80 tonnes of HFC23 and up to 6 tonnes of SF_6 per year. These substances are almost harmless for human health and local environment but have high values of GWP.

Some amount of HFC23 is sold as a market product, but the market for HFC23 is limited in Russia and can not consume the entire volume of HFC23 generated in the process of HCFC22 manufacturing.

HFC23 is destroyed in the existing unit for thermal destruction of FOC after all the other substances as provided by the unit capacity, while the priority is given to more toxic substances. SF_6 is not destroyed at all. The existing thermal destruction unit is functional and can be operated in normal mode without any significant financial investments at least until 2012.

This situation could have continued in the future since the enterprise does not violate any standards and has a valid permit for emissions and an approved level of MPE for corresponding sources. Furthermore, emission of HFC23 and SF_6 is a common practice not only in Russia but in other countries as well (in most developing countries, HFC23 and SF_6 emissions are not regulated at all).

Even though HFC23 and SF_6 emissions are restricted in Russia, fines **are not set** for these emissions and the emitter does not pay for them. There are no limitations to GHG emissions for individual enterprises in Russia so far and they are not expected to be introduced at least until 2012.

The scenario, under which the existing practice is continued, is considered as the baseline scenario by AM0001 methodology.

The main risk to the baseline is a limit that could be imposed on the use of HCFC22 as refrigerant or propellent (which are both considered main options of usage in the Montreal Protocol) by the Government. This could impact production of HCFC22 at KCKK Polimer Plant.

HCFC22 is included in List C of the Montreal Protocol. Copenhagen, Montreal and Beijing amendments to the said protocol were adopted by the Russian Government in 2005 (Decree No.539 “On adoption of amendments to Montreal Protocol regarding substances which destroy the ozone layer by the Russian Federation” dated 27.08.2005). However no limitations or restrictions with regard to the substances included in List C have been introduced by the Russian Government so far. Because of that there is a certain risk that such limitations could be sooner or later introduced. However this will impact on the baseline only slightly as the major part (90% and even more) of HCFC22 produced at Polimer Plant is utilized as raw material for tetrafluorethylene production. Thus the risk can be considered minimal.

Taking above into account, *Alternative 1 can be considered as the most likely baseline scenario*.

Alternative 2: Destruction of the total volume of HFC23 and SF_6 in the existing unit for thermal destruction of fluorine organic compounds

The existing unit for thermal destruction of FOC is technically unable to destroy the entire additional volume of HFC23 and SF_6 as it already destroys a significant amount of liquid and gaseous wastes from other production lines that are more toxic than HFC23 and SF_6 and, therefore, they are given the priority.

In view of the above, *Alternative 2 was excluded from further consideration.*

Alternative 3: Sale of HFC23 and SF_6 as commercial commodities

The plant currently operates rectification column of saleable HFC23 production line, which annually generates some amount of this product. During the period 2002-2006, the maximum amount of HFC23 recovered for sale was 14.2 tonnes in 2006. The market of saleable HFC23 in Russian is extremely limited and can not have any significant impact upon the scale of HFC23 destruction, and neither is it able to consume the entire amount of generated HFC23. In order to reduce HFC23 emissions, the market would first have to consume the entire amount of HFC23 currently destroyed[11]. As a matter of fact, only "KCKK Polimer Plant" Ltd. currently destroys around 100 tonnes of HFC23 per year, while the total market for HFC23 is estimated at 35 tonnes per year[12].

SF_6 (or elegas) is one of market product produced by the plant. In the process of by-product separation (carbon tetrafluoride (CF_4)) in the SF_6 rectification unit, an insignificant amount of SF_6 (about 2% of the commercial output of SF_6) escapes with the by-product and is released to the atmosphere through the venting system. In fact, this way the plant loses some amount of saleable SF_6. However, technological losses are quite normal and economically justified in production of high-purity substances. Further improvement of the rectification system efficiency would lead to escalation of costs, which would not be covered by the higher commercial output of products.

In view of the above, *Alternative 3 was excluded from further consideration.*

Alternative 4: The project activity as not JI

The project activity involves installation of a new unit for thermal destruction of fluoroine organic compounds in addition to the existing one, as well as provision of a waste gas purification and neutralization system. Thus, it will become possible to destroy the bulk of HFC23 and SF_6 emissions from the stack with high efficiency (not less than 99.99%) and without causing any damage to the environment.

Construction of a new FOC destruction unit entails significant capital and operating costs. However, this project as not JI would not bring any economic or other benefits to the enterprise, other than small revenue from selling the mixture of acids that could hardly cover 10% of the unit operating costs. As mentioned above, the plant does not exceed the MPE levels specified for HFC23 and SF_6, and no fines are levied on these emissions. The project does not bring any benefits for the local environment, since HFC23 and SF_6 are virtually harmless substances. There are no restrictions on GHG emissions from enterprises in Russia. Under these conditions the available finances could have been used for development of the core production of "KCKK Polimer Plant" Ltd..

The project does not fit into the common practice in the Russian chemical industry. Having a valid permit for emissions within the limits of MPE, agreed with the state environmental supervisory bodies, emitters are, typically, not interested in making sizeable investments into complete destruction of non-toxic pollutants, for emissions of which no payment is charged.

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[11] If the market demand increases, the sales will be first of all increased through reduction of the part of HFC23 destroyed and secondly, by means of reducing the emissions into the atmosphere, since the emitter does not pay for HFC23 emissions, whereas destruction of HFC23 costs a lot.

[12] According to 2002 data.

Thus, *implementation of Alternative 4 is unlikely.*

Summarizing the above said, Alternative 1, which envisages continuation of the existing situation, was chosen as the baseline scenario.

Additionality analysis

Taking into account the above analysis of the alternatives, the project additionality is justified by the following main factors:

1. Russian regulations do not require destruction of the total amount of HFC23 or SF_6 emissions. HFC23 and SF_6 emissions are almost harmless and fines are not charged for those. There are no limitations to GHG emissions from enterprises in Russia and those are not expected at least until 2012.
2. Without JI mechanism, the enterprise would not realize any significant benefits from destruction of an additional volume of HFC23 and from destruction of the total amount of waste SF_6.
3. At present, the common practice in Russia for the HFC23 and SF_6 industrial producers is the situation when, having an approved level of MPE for emission sources, the plant is emitting these substances within the specified limits. With an emission permit in place, the plant does not, typically, have an incentive to incur significant investments into complete destruction of non-toxic emissions, for which it does not incur any penalties. Additional destruction of organic chlorofluorine compounds does not bring any significant benefits to the plant other than the possibility to participate in JI mechanism, however it entails significant costs and furthermore, it requires some experience in the sphere.

Therefore, GHG emission reductions would not occur in the absence of the proposed project activity. Whereas the proposed project activity would allow achieving almost complete destruction of HFC 23 and SF_6 and thus the quantity of wastes destroyed will be greater than the baseline quantity destroyed. The project is therefore proven to be additional in accordance with the requirements for proving additionality outlined in AM0001/Version 05.1.

B.3. Description of how the definition of the project boundary is applied to the project:

The following equipment and associated emission sources are included in the project boundaries (see Fig. D.1-1):
1. Unit for thermal destruction of FOC (new unit installed under JI project) including waste gases absorption [shop No.2];
2. Rectification column No.70 and condenser No.49 in shop No.76, sulfur hexafluoride rectification column No.40 in shop No.2
3. Commercial HFC23 production unit [shop No.22];
4. Transportation lines of waste flows of HFC23 and sulfur hexafluoride rectification from rectification and condensation columns to the unit for thermal destruction of FOC.

Table B.3-1 shows which emission sources are included and which are excluded from the project boundaries and baseline.

Table B.3-1. Sources of emissions included in or excluded from consideration

	Source	Gas	Incl./Excl.	Justification / Explanation
Baseline	Emissions of waste HFC23, avoided due to the project	**HFC23**	**Incl.**	**Main source of emissions**
	Emissions of waste SF_6, avoided due to the project	**SF_6**	**Incl.**	**Main source of emissions**
Project activity	Emissions due to HFC23 not destroyed (leaks to air)	**HFC23**	**Incl.**	**Main source of emissions. Considered negligible, but included to be conservative.**
	Emissions due to not destroyed SF_6 (leaks to air)	**SF_6**	**Incl.**	**Main source of emissions. Considered negligible, but included to be conservative.**
	Emissions due to CO_2 from destroyed HFC23	**CO_2**	**Incl.**	**Main source of emissions. Considered negligible, but included to be conservative.**
	Emissions due to leaks of HFC23 to liquid effluents	HFC23	Excl.	Considered negligibly small *
	Emissions due to leaks of SF_6 to liquid effluents	SF_6	Excl.	Considered negligibly small **
Leakages	Emissions due to grid electricity supply for destruction process	**CO_2**	**Incl.**	**Main source of emissions. Considered negligible, but included to be conservative.**
		CH_4	Excl.	Considered negligibly small
		N_2O	Excl.	Considered negligibly small
	Emissions due to transportation of the mixture of acids	CO_2	Excl.	Considered negligibly small ***
		CH_4	Excl.	Considered negligibly small
		N_2O	Excl.	Considered negligibly small

* As stated in AM0001 methodology, HFC23 can theoretically leak to water effluents and then escape to the atmosphere. This possibility is ignored as it is negligibly small: the solubility of HFC23 is 0.1% wt at 25°C water. Therefore, here we do not determine the amount of HFC23 leaked into liquid effluents.

** This possibility is not taken into account since this leak is negligibly small. SF_6 is almost insoluble in water because of its nonpolarity and inertness.

*** The estimation of this type of leakages is given below.

The produced mixture of acids containing not less than 32% of HF (hydrofluoric acid) and an insignificant admixture of HCl is transported in railway tanks to three main points of destination. Point of destination: Glasov railway station, Perm Region (180 km), Asbest railway station, Sverdlov Region (925 km), Kupavna railway station, Moscow Region (903 km). Following the conservative approach, we assume the length of haul for the total amount of the acids mixture to be 900 km, electric locomotive power - 4 MW, average speed - 60 km/h. Emissions factor for grid electricity consumption according to "*Guidelines for Project Design Documents of Joint Implementation Projects. Volume 1. General guidelines. Version 2.3. Ministry of Economic Affairs of the Netherlands. May 2004*" is assumed rounded to 0.6 tonnes CO_2/MWh. In accordance with the design documentation production of the mixture of acids will amount to 872 tonnes per year, which is equivalent to around 15 railway tanks. It is assumed that a train consists of 60 tank cars. Therefore emissions due to transportation of the mixture of acids will amount to:

E_transport = (900/60)*4*0.6*(15/60) = 9 tonnes of CO_2 per year.

The resulting value is very small as compared to the achieved reductions (less than 0.001%). Taking this factor into account does not make the approach more conservative, as it is absorbed by inaccuracy of measurements. In view of the above the developer considered it possible to neglect this factor and to exclude it from further consideration.

Furthermore, emissions due to production of hydrogen which is used as fuel were excluded, since hydrogen is a by-product of caustic soda manufacturing at "KCKK Polimer Plant" Ltd. and only a small amount of it is recovered. The project does not have any impact upon hydrogen output and, therefore, emissions due to its production are equal to respective emissions under the baseline.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of BL setting – 19 October 2007

BL was developed by the specialists of Camco International Ltd.

Contact person: Konstantin Zabelin

e-mail: konstantin.zabelin@camco-international.com

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The 1st of April 2008 (commissioning of the FOC thermal hydrolysis unit)

C.2. Expected operational lifetime of the project:

20 years/240 months

C.3. Length of the crediting period:

57 months (from the 1st of April 2008 till the 31st of December 2012)

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The monitoring system is based on the approved CDM methodology AM0001/Version 05.1 *"Incineration of HFC23 waste streams"*.

The monitoring includes measurements of the following parameters (see Fig. D.1-1):

1. The quantity of technological emissions of HFC23 and SF_6 from HCFC22 and sulfur hexafluoride production lines is measured continuously by mass flow meters installed on the outlet pipelines from emission sources. Content of HFC23 and SF_6 is measured by laboratory chromatographs once a week or more often in case technological mode change.

2. The quantity of HFC23 and SF_6 supplied to the thermal hydrolysis unit is measured continuously by two down-the-line flow meters installed on each waste feeding line. Content of HFC23 and SF_6 is measured by laboratory chromatographs once a week or more often in case technological mode change.

3. The volume of effluent gases from the unit is measured by a volumetric meter. HFC23 content in the gases is measured by laboratory chromatograph once a week.

4. The quantity of produced HCFC22 is determined on a monthly basis as a sum of commercial HCFC22 output (measured by collector level meter) and the readings of the mass flow meter of tetrafluorethylene (monomer -4) production further multiplied by HCFC22 consumption factor for monomer-4 production.

5. The quantity of produced SF_6 is determined on a monthly basis as a sum of the product loaded into cylinders and containers (measured by scales) and the finished product left in the collector (measured by the collector level meter).

6. The quantity of HFC23 recovered for sale is determined on a monthly basis as a sum of the amount of the product loaded into cylinders and containers (measured by scales) and finished product left in the collector (measured by the level meter of the finished product collector).

7. Electricity consumption is measured by an electricity meter.

8. The quantity of gaseous emissions (CO, HCl, HF, Cl_2, organic carbon, dioxins and NOx) is measured in compliance with the current environmental standards of Russia.

9. The amount of liquid effluents and its parameters (pH, COD BOD, suspended solids, fluorides and metals) are not measured as only utilizable wastes are generated in the production process.

All the measuring equipment meets up-to-date standards and is subject to regular calibration.

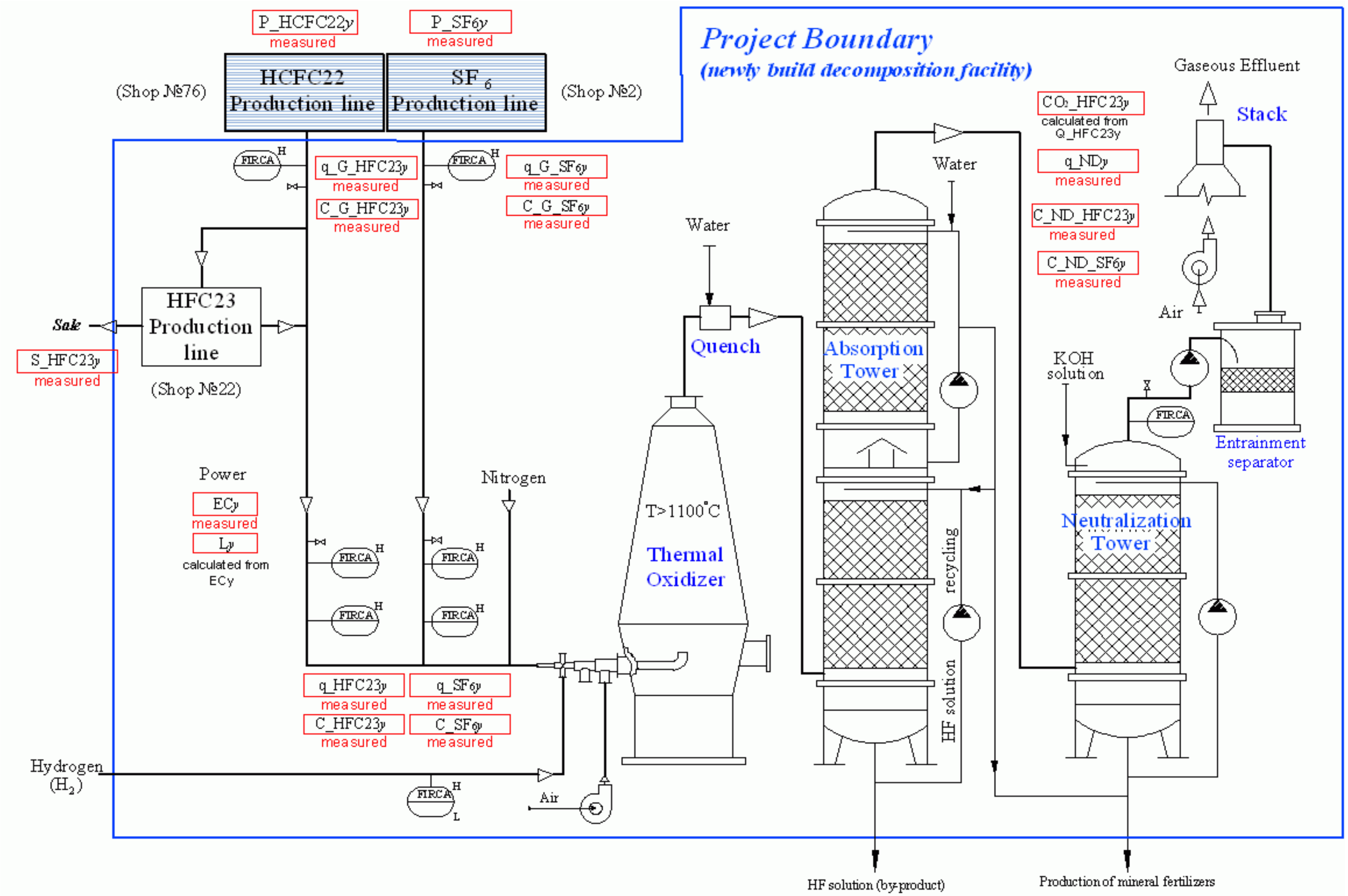

Fig. D.1-1. The principal monitoring diagram

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. q_HFC23_y	Quantity of HFC23 wastes supplied to destruction process	Mass flow meter	kg	(m) measured in parallel by two flow meters	Monthly (measurements at least once per hour)	100%	Electronic and paper	Measured directly before the unit. Monthly data is the sum of the accumulated data. Readings are taken at least once an hour and the lowest reading of the two flow meters is chosen.
2. C_HFC23_y	Concentration of HFC23 supplied to destruction process	Chromatograph	%	(m) Measured	Monthly (weekly measurements)		Electronic and paper	
3. q_ND_y	Volume of gaseous effluent from the unit	Volumetric flow meter	m^3	(m) Measured	Monthly (measurements once per hour)	100%	Electronic and paper	
4. $C\_ND\_SF_{6y}$	Concentration of SF_6 in gaseous effluents from the unit	Chromatograph	mg/m^3	(m) Measured	Monthly		Electronic and paper	Measured weekly. If the thermal hydrolysis unit stops additional analyses are performed to estimate SF_6 leaks.

5. $C\_ND\_HFC23_y$	Concentration of HFC23 in gaseous effluents from the unit	Chromatograph	mg/m^3	(m) Measured	Monthly		Electronic and paper	Measured weekly. If the thermal hydrolysis unit stops additional analyses are performed to estimate SF_6 leaks.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

The project GHG emissions during the year *y,* t CO_2-e:

$$E\_DP_y = ND\_HFC23_y \times GWP\_HFC23 + ND\_SF_{6y} \times GWP\_SF_6 + Q\_HFC23_y \times EF \text{ ,} \quad \text{(D.1-1)}$$

where ND_HFC23_y is the quantity of HFC23 not destroyed in the unit during the year *y*, t;

ND_SF_{6y} is the quantity of SF_6 not destroyed in the unit during the year, *y*, t;

Q_HFC23_y is the quantity of HFC23 supplied for destruction into the unit during the year *y*, t;

EF is the emissions factor that determines the amount of CO_2 generated per 1 tonne of destroyed HFC23. According to CDM methodology AM0001, EF = 0.62857 t CO_2-e/t;

GWP_HFC23 is the Global Warming Potential (GWP) that converts 1 tonne of HFC23 to tonnes of CO_2 equivalent, t CO_2-e/t. The approved GWP value for HFC23 is 11 700 t CO_2-e/t for the first commitment period under the Kyoto Protocol;

GWP_SF_6 is the Global Warming Potential (GWP) for conversion of 1 ton of SF_6 o tons of CO_2 equivalent, t CO_2-e/t. The approved GWP value for SF_6 is 23 900 t CO_2-e/t for the first commitment period under the Kyoto Protocol.

$$ND\_HFC23_y = q\_ND_y \times C\_ND\_HFC23_y \times 10^{-9} \text{ ,} \quad \text{(D.1-2)}$$

$$ND\_SF_{6y} = q\_ND_y \times C\_ND\_SF_{6y} \times 10^{-9} \text{ ,} \quad \text{(D.1-3)}$$

$$Q\_HFC23_y = q\_HFC23_y \times \frac{C\_HFC23_y}{100} \times 10^{-3} \text{ ,} \quad \text{(D.1-4)}$$

where q_ND_y is volume of gaseous emissions from destruction process during the year y, m^3;

q_HFC23_y is the amount of HFC23 wastes supplied for destruction during the year y, kg;

$C\_ND\_HFC23_y$ is the average annual concentration of HFC23 in gaseous emissions from the unit during the year y, mg/m^3;

$C\_ND\_SF_{6y}$ is the average annual concentration of SF_6 in gaseous emissions from the unit during the year y, mg/m^3;

C_HFC23_y is the average annual concentration of HFC23 in wastes supplied for destruction during the year y, %;

D1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
6. S_HFC23_y	Quantity of HFC23 recovered for sale	Scales and level meter in the collector	t	(m) measured	Monthly	100%	Electronic and paper	
7. $q\_G\_HFC23_y$	Quantity of HFC23 wastes at the outlet of shop No.76	Mass flow meter	kg	(m) measured	Monthly (readings are recorded weekly)	100%	Electronic	
8. $q\_G\_SF_{6y}$	Quantity of SF_6 wastes at the outlet of rectification column of shop No. 2	Mass flow meter	kg	(m) measured	Monthly (readings are recorded weekly)	100%	Electronic	

9. q_SF_{6y}	Quantity of SF_6 wastes supplied for destruction from shop No.2	Mass flow meter	kg	(m) measured in parallel by flow meter.	Monthly (measured not less than once per hour)	100%	Electronic	Measured directly before the unit. Monthly data is the sum of the accumulated data. Readings are taken at least once an hour and the lowest reading of the two flow meters is chosen.
10. $C\_G\_HFC23_y$	Concentration of HFC23 in wastes at the outlet of shop No.76	Chromatograph	%	(m) measured	Monthly (readings are recorded weekly)	-	Electronic and paper	
11. $C\_G\_SF_{6y}$	Concentration of SF_6 in wastes at the outlet of rectification column of shop No. 2	Chromatograph	%	(m) measured	Monthly (readings are recorded weekly)	-	Electronic and paper	
12. C_SF_{6y}	Concentration of SF_6 in wastes supplied for destruction from shop No.2	Chromatograph	%	(m) measured	Monthly (readings are recorded weekly)	-	Electronic and paper	

13. P_HCFC22_y	The quantity of HCFC22 produced at the plant, which is a source of HFC23 emissions	Level meter in the collector and readings of mass flow meter of monomer-4 production multiplied by the HCFC22 consumption factor for monomer-4 production	t	(m) measured (c) calculated	Monthly	100%	Electronic and paper	Data for application of the cut-off condition
14. P_SF_{6y}	Quantity of SF_6 produced at the plant	Scales and level meter in the collector	t	(m) measured	Monthly	100%	Electronic and paper	Data for application of the cut-off condition

D1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

At first HFC23 and SF_6 leaks to the atmosphere within the project boundary are calculated <u>according to actual data</u> during the year *y*, t:

$$L\_HFC23_y = G\_HFC23_y - Q\_HFC23_y - S\_HFC23_y, \quad \text{(D.1-5)}$$

$$L\_SF_{6y} = G\_SF_{6y} - Q\_SF_{6y}, \quad \text{(D.1-6)}$$

where G_HFC23_y is the amount of HFC23 at the outlet from HCFC22 production line during the year *y*, t;

G_SF_{6y} is the amount of SF_6 contained in waste flows from rectification column of SF_6 production during the year *y*, t;

Q_SF_{6y} is the quantity of SF_6 supplied for destruction to the unit during the year *y*, t;

S_HFC23_y is the amount of HFC23 recovered for sale during he year *y*, t.

$$G\_HFC23_y = q\_G\_HFC23_y \times \frac{C\_G\_HFC23_y}{100} \times 10^{-3}, \quad \text{(D.1-7)}$$

$$G\_SF_{6y} = q\_G\_SF_{6y} \times \frac{C\_G\_SF_{6y}}{100} \times 10^{-3}, \quad (D.1\text{-}8)$$

$$Q\_SF_{6y} = q\_SF_{6y} \times \frac{C\_SF_{6y}}{100} \times 10^{-3}, \quad (D.1\text{-}9)$$

where $q\_G\_HFC23_y$ is the amount of wastes containing HFC23 at the outlet of shop No.76 during the year y, kg;

$q\_G\_SF_{6y}$ is the amount of wastes containing SF_6 at the outlet of rectification column of shop No.2 during the year y, kg;

q_SF_{6y} is the amount of wastes containing SF_6 supplied for destruction from shop No.2 during the year y, kg;

$C\_G\_HFC23_y$ is the average annual concentration of HFC23 in wastes at the outlet of shop No.76 during the year y, %;

$C\_G\_SF_{6y}$ is the average annual concentration of SF_6 in wastes at the outlet of rectification column of shop No.2 during the year y, %;

C_SF_{6y} is the average annual concentration of SF_6 in wastes supplied for destruction from shop No.2 during the year y, %;

Further baseline calculations are made with allowance for the cut-off conditions:

$$G\_HFC23_y \le MIN\left\{P\_HCFC22_y;\ P\_HCFC22_{Hist,\max}\right\} \times w_h, \quad (D.1\text{-}10)$$

$$G\_SF_{6y} \le MIN\left\{P\_SF_{6y};\ P\_SF_{6Hist,\max}\right\} \times w_s, \quad (D.1\text{-}11)$$

where P_HCFC22_y is the amount of HCFC22 produced at “KCKK Polimer Plant” Ltd. during the year y, t;

P_SF_{6y} is the amount of saleable SF_6 produced at “KCKK Polimer Plant” Ltd. during the year y, t;

$P\_HCFC22_{Hist,\max}$ is the maximum annual amount of HCFC22 produced at the plant during the historical period, t. For $P\_HCFC22_{Hist,\max}$ we take the maximum annual volume of HCFC22 production at “KCKK Polimer Plant” Ltd. during the period of 2002-2004. According to Section B.1 $P\_HCFC22_{Hist,\max}$ = 16 956.5 t (2004);

$P\_SF_{6Hist,\max}$ is the maximum annual amount of saleable SF_6 produced at the plant during the historical period, t. For $P\_SF_{6Hist,\max}$ we take the maximum annual volume of saleable SF_6 produced at “KCKK Polimer Plant” Ltd. during the 2002-2004. According to Section B.1 $P\_SF_{6Hist,\max}$ = 219.9 t (2004);

w_h is the fraction of HFC23 per unit of HCFC-22 produced at the plant. For the fraction w_h we assume its minimum average annual value according to actual data of "KCKK Polimer Plant" Ltd. during the period 2002-2004. According to Section B.1 w_h = 1.06% (2004);

w_s is the fraction of SF_6 contained in waste flows from rectification column of SF_6 production per unit of saleable SF_6 produced at the plant. For the fraction w_s we assume its minimum average annual value according to actual data of "KCKK Polimer Plant" Ltd. during the period 2002-2004. According to Section B.1 w_s = 1.40% (2002).

Baseline GHG emissions during the year y, t CO_2-e:

$$BE_y = (Q\_HFC23_y - B\_HFC23_y) \times GWP\_HFC23 + (Q\_SF_{6y} - B\_SF_{6y}) \times GWP\_SF_6 , \tag{D.1-12}$$

Where B_HFC23_y is the baseline quantity of HFC23 destroyed during the year y, т;

B_SF_{6y} is the baseline quantity of SF_6 destroyed during the year y, т.

$$Q\_HFC23_y = G\_HFC23_y - S\_HFC23_y - L\_HFC23_y , \tag{D.1-13}$$

$$Q\_SF_{6y} = G\_SF_{6y} - L\_SF_{6y} , \tag{D.1-14}$$

$$B\_HFC23_y = G\_HFC23_y - S\_HFC23_y - MPE\_HFC23_{Hist,\min} , \text{ if } B\_HFC23_y < 0, \text{ then we take that } B\_HFC23_y = 0, \tag{D.1-15}$$

$$B\_SF_{6y} = G\_SF_{6y} - MPE\_SF_{6Hist,\min} , \text{ if } B\_SF_{6y} < 0, \text{ then we take that } B\_SF_{6y} = 0, \tag{D.1-16}$$

Where G_HFC23_y is the amount of HFC23 generated in HCFC22 production line with allowance for the cut-off condition (D.1-10) during the year y, t;

G_SF_{6y} is the amount of SF_6 with allowance for the cut-off condition (D.1-11) contained in waste flows from the rectification column of SF_6 production during the year y, t;

$MPE\_HFC23_{Hist,\min}$ is the maximum permissible emissions (MPE) of HFC23 to the atmosphere from sources within the project boundary (condensation and rectification column of HCFC22 production line and rectification column of saleable HFC23 production line) during the year y based on historical data (2002-2004), t. According to Section B.1 $MPE\_HFC23_{Hist,\min}$ = 83.4 t;

$MPE\_SF_{6\,Hist,\min}$ is the minimum level of the maximum permissible emissions (MPE) of SF_6 to the atmosphere from sources within the project boundary (SF_6 rectification column) during the year *y* based on historical data (2002-2004), t. According to Section B.1 $MPE\_SF_{6\,Hist,\min}$ = 6.02 t.

D.1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

This section is not applicable to this project.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

D.1.3. Treatment of leakage in the monitoring plan:

As shown in Section B, only GHG emissions due to grid electricity consumption for operation of the new FOC thermal destruction unit are significant leakages.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
15. EC_y	Electricity consumption for destruction process	Meter	MWh	(m) Measured	Monthly	100%	Electronic	

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Leakages due to grid electricity consumption during the year *y* are calculated as follows, t CO_2:

$$L_y = EC_y \times EF_{CO2,grid,y} \times 10^{-3}, \quad \text{(D.1-17)}$$

Where EC_y is electricity consumption by the thermal destruction unit during the year *y*, MWh;

$EF_{CO2,grid,y}$ is the CO_2 emissions factor for grid electricity during the year *y*, kg CO_2/MWh. According to *Operational Guidelines for Project Design Documents of Joint Implementation Projects. Volume 1. General guidelines. Version 2.3. Ministry of Economic Affairs of the Netherlands. May 2004.* GHG emission factor for grid electricity consumed in Russia varies for different years of the crediting period (2008-2012) as follows: $EF_{CO2,grid,2008}$ = 565 kg CO_2/MWh, $EF_{CO2,grid,2009}$ = 557 kg CO_2/MWh, $EF_{CO2,grid,2010}$ = 550 kg CO_2/MWh, $EF_{CO2,grid,2011}$ = 542 kg CO_2/MWh, $EF_{CO2,grid,2012}$ = 534 kg CO_2/MWh.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Emission reductions during the year *y* measured in t CO_2e are calculated as follows:

$$ER_y = BE_y - E\_DP_y - L_y. \quad \text{(D.1-18)}$$

D1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

Gaseous effluents (CO, HCl, HF, Cl2, dioxin and NO_X) are regularly measured at the thermal destruction unit in accordance with the approved rules. The enterprise files annual consolidated reports on emissions as per the official annual statistical form 2-TP (air) *Air protection data,* which contains information on amounts of trapped and neutralized atmospheric pollutants, itemized emissions from specific sources, number of emission sources, measures on reduction of emissions to the atmosphere, emissions from particular groups of pollution sources. The enterprise is subject to regular control by state bodies of environmental supervision. The Head of Environmental Department of "KCKK Polimer Plant" Ltd. is responsible for collection, storage and analysis of data regarding the environmental impact of the project in the region.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.1.1.1 ID 1	low	Measured by two down-the-line flow meters. Instrument error ±0.5%. Following the conservative approach the least value of the two flow meters is taken into consideration at each data reading. If the readings of the flow meters differ by greater than twice their claimed accuracy then measures are taken to remedy the fault. Flow meters shall be calibrated in compliance with the requirements of the Federal Agency for Technical Control and Metrology. The zero check on the flow meters shall be conducted every week. If the zero check indicates that the flow meter is not stable, an immediate calibration of the flow meter shall be undertaken.
Table D.1.1.3 ID 9	low	
Table D.1.1.1 ID 2	low	Cross-checked with the previous chromatograph analysis. Frequency of recalibration is in compliance with the requirements of the Federal Agency for Technical Control and Metrology. Relative error of used methodologies correspondingly is: ID 4 – 20%, ID5 – 24%, others – 5%.
Table D.1.1.1 ID 4	medium	
Table D.1.1.1 ID 5	medium	
Table D.1.1.3 ID 10	low	
Table D.1.1.3 ID 11	low	
Table D.1.1.3 ID 12	low	
Table D.1.1.1 ID 3	low	Flow meter is subject to regular calibration. The accuracy of the equipment has little influence on accuracy of GHG emission reduction calculations.
Table D.1.1.3 ID 6	low	Cross-checked with accounting reports.
Table D.1.1.3 ID 7	low	Instrument error ±0.5%. Frequency of recalibration is in compliance with the requirements of the Federal Agency for Technical Control and Metrology.
Table D.1.1.3 ID 8	low	
Table D.1.1.3 ID 13	low	Cross-checked with production and accounting reports
Table D.1.1.3 ID 14	low	
Table D.1.3.1 ID 15	low	Electricity meter is subject to regular calibration

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

The monitoring plan described above was set forth by the Order of the Director of the Plant №153 dated 01.04.2008. According to this document all readings in line with the monitoring plan have to be recorded under an established procedure and persons responsible for data collection and storage appointed, namely – technologists of the corresponding shops (2, 22, 76) and chief power engineer of the enterprise starting on April 1, 2008. Production Manager – Deputy Director for Ecology, was appointed responsible for the execution of the Order.

The terms and procedures identified for day-to-day records handling and dealing with erroneous measurements are provided in the following documents:

1. Methodologies M-256-2-2007, MZ-57-2007 and MZ-111-2007.
2. "Calculation algorithms" to performance specification for technological programming of circuits APB, APS, APR and APM database "Unit for thermal destruction of FOC".

All input data is regularly collected. The Head of Technical Department and the Head of Environmental Department of "KCKK Polimer Plant" Ltd. are responsible for data submission and execution of reporting documentation under the project.

Calculations of emission reductions will be prepared by Camco International on annual basis (by February 15) as required by the Russian JI Regulation.

All data will be stored at least for two years after the last ERU tranche under the project.

Additional details of procedures for unit operation, maintenance and personnel training are described in Annex 4.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Monitoring plan was developed by Camco International Ltd

Contact person: Konstantin Zabelin

E-mail: konstantin.zabelin@camco-international.com

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The project emissions include:

- Emissions of HFC23 not destroyed;
- Emissions of SF_6 not destroyed;
- Emissions of CO_2 generated in the process of HFC23 destruction.

The project emissions are calculated using the formula (B.1-10). All input data and factors are presented in Section B.1. The results of calculations are presented in Table E.1-1.

Table E.1-1. Estimated GHG emissions under the project, tonnes of CO_2e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
HFC23	170	242	260	276	286	1234
SF_6	17	23	23	23	23	109
CO_2	92	130	140	148	153	663
Project emissions, total	**278**	**395**	**424**	**448**	**462**	**2007**

E.2. Estimated leakage:

As shown in Section B, significant leakages are GHG emissions due to grid electricity consumption required for operation of the thermal destruction unit. GHG leakages under the project are calculated using the formulae (B.1-11) and (B.1-12). All input data and factors are presented in Section B.1. The results of calculations are presented in Table E.2-1.

Table E.2-1. Estimated GHG leakages, tonnes of CO_2-e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
CO_2 emissions due to grid electricity consumption	215	301	319	333	339	**1 507**

E.3. The sum of E.1. and E.2.:

The sum of project emissions and leakages in shown in Table E.3-1 below.

Table E.3-1. The sum of project emissions and leakages, tonnes of CO_2-e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
The sum of project emissions and leakages	**494**	**696**	**743**	**780**	**801**	**3 514**

E.4. Estimated baseline emissions:

The baseline GHG emissions include:

- Emissions of HFC23 avoided due to the project;
- Emissions of SF_6 avoided due to the project.

The baseline emissions are calculated using the formula:

$$BE_y = (Q\_HFC23_y - B\_HFC23_y) \times GWP\_HFC23 + (Q\_SF_{6y} - B\_SF_{6y}) \times GWP\_SF_6 . \quad \text{(E.1-1)}$$

All input data and factors are presented in Section B.1. The results of calculations of the baseline emissions are presented in Table E.4-1.

Table E.4-1. Estimated GHG emissions under the baseline, tonnes of CO_2-e

Value name	Reporting years					
	2008	**2009**	**2010**	**2011**	**2012**	**2008-2012**
HFC23	731 458	975 277	975 277	975 277	975 277	4 632 566
SF_6	55 204	73 605	73 605	73 605	73 605	349 624
GHG emissions under the baseline	**786 662**	**1 048 882**	**1 048 882**	**1 048 882**	**1 048 882**	**4 982 190**

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

The GHG emission reductions are presented in Table E.5-1.

Table E.5-1. GHG emission reductions, tonnes of CO_2-e

Value name	Reporting years					
	2008	**2009**	**2010**	**2011**	**2012**	**2008-2012**
HFC23	731 288	975 035	975 017	975 001	974 991	4 631 332
SF_6	55 187	73 582	73 582	73 582	73 582	349 515
CO_2	-307	-431	-459	-481	-492	-2 170
GHG emission reductions, total	**786 167**	**1 048 186**	**1 048 139**	**1 048 102**	**1 048 081**	**4 978 675**

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

Years	**Estimated project emissions ($t\ CO_2\ e$)**	**Estimated leakages ($t\ CO_2\ e$)**	**Estimated baseline emissions ($t\ CO_2\ e$)**	**Estimated emission reductions ($t\ CO_2\ e$)**
2008	278	215	786 662	786 167
2009	395	301	1 048 882	1 048 186
2010	424	319	1 048 882	1 048 139
2011	448	333	1 048 882	1 048 102
2012	462	339	1 048 882	1 048 081
Tota ($t\ CO_2\ e$)	**2 007**	**1 507**	**4 982 190**	**4 978 675**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

According to the Russian regulations, the project can be regarded as a project aimed at expansion and technical upgrading of production, which is subject to Industrial Safety Appraisal and does not require Environmental Impact Assessment. Nevertheless, EIA documentation was developed for the project.

Besides, Bashkiria Republican Scientific and Research Environmental Centre conducted a research to identify the content of dioxins in the products of HFC23 and SF_6 thermal hydrolysis when employing the technology proposed by the project.

The main findings of the environmental impact assessment are as follows.

Impact upon air

Technological and Environmental Supervision Department of Rostekhnadzor in Kirov Region issued the "Permit for Pollutant Emissions to The atmosphere from Stationary Sources" to "KCKK Polimer Plant" Ltd.. According to this document, the total emissions of pollutants are fixed for the enterprise at 3647.129 t/year for 2006, and at 3630.212 t/year for 2007. According to the reports (on air pollution), actual emissions in 2006 amounted to 2712.894 tonnes, i.e. emissions did not exceed the permitted level.

The estimated total emissions of pollutants to the atmosphere from the new thermal destruction unit, according to the mass balance of production will amount to 182.3 kg/year, including:

- Nitrogen oxides (NO_X) – 127.9 kg;
- Trifluoromethane (HFC23) – 19.6 kg;
- Hydrogen fluoride (HF) – 2.5 kg;
- Hydrogen chloride (HCl) – 2.5 kg;
- Chlorine (Cl_2) – 2.5 kg;
- Carbon oxide (CO) – 25.5 kg;
- Difluorochloromethane (HCFC 22) – 0.9 kg;
- Sulphur hexafluoride (SF_6, elegas) – 0.9 kg.

Of the emitted substances, trifluoromethane, carbon oxide, difluorochloromethane and sulphur hexafluoride are ranked under the 4th hazard class, i.e. they are of little hazard, and other substances are ranked under the 2nd and 3rd hazard classes.

The content of PCDDs/Fs[13] in waste gases from the HFC23 and SF_6 thermal destruction process amounted to 4.70 pg/m^3 (TEQ-WHO). The absence of the most toxic isomers of PCDDs/Fs and low content of other isomers allow to speak about background content of PCDDs/Fs in the off gases from the HFC23 and SF_6 thermal destruction process.

The new thermal destruction unit provides for emissions purification to achieve sanitary standards and their further dispersion. The design of the unit does not envisage generation of liquid effluents and their discharge into water bodies, or generation of solid wastes subject to disposal at landfills.

Environmental actions envisaged by the project for mitigation of negative environmental impact are as follows:

- Local purification of gases generated in thermal destruction of HFC23 and SF_6 waste streams from acidic impurities and recovery of a commercial mixture of hydrofluoric and hydrochloric

[13] Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) collectively called PCDDs/Fs.

acids, and further neutralization, release and dispersion of gases in the atmosphere within the limits of $MPC_{max.one-time}$[14] in the inhabited area;

- Introduction of gaseous wastes decomposition under vacuum, which almost excludes pollutant emissions in the ambient space, significantly reduces gas accumulation in the operation zone and improves work safety conditions for the maintenance personnel;

In view of the above, it can be projected that the new thermal decomposition unit will cause practically no air pollution and will not impair the current air condition, and owing to reduction of GHG emissions, the project will even have some positive effect.

It is not reasonable to calculate maximum ground level concentration of pollutants in emissions from the new unit, because these emissions account for 0.006 % of the actual aggregate emission from "KCKK Polimer Plant" Ltd. in 2006.

The aggregate pollutant emission from the polymer plant after the project implementation will be reduced through thermal destruction of HFC23 and SF_6 waste streams previously released to the atmosphere.

Water effluents and their impact

In operation of the thermal destruction unit, no liquid effluents are discharged to water bodies, as the project envisages the following:

- The water of reaction is used to produce a commercial mixture of hydrofluoric and hydrochloric acids;

- The water supplied to create a water ring of vacuum pumps circulates in a closed-cycle and is cooled with return water to ensure normal operation of the vacuum equipment;

- Spent caustic solution with KOH concentration less than 1.0 % wt and water after equipment flushing and floor mopping, after neutralization with 5%-solution of KOH, is further processed into a potassium additive for compound fertilizers production at "KCKK Mineral Fertilizers Plant" Ltd.

Wastes and their impact

The total amount of industrial and household wastes generated at "KCKK Polimer Plant" Ltd. upon commissioning of the new unit and the impact of these wastes upon the environment remains at the current level due to the following:

- Liquid wastes will be sold as a commercial mixture of hydrofluoric and hydrochloric acids and as a potassium additive for compound fertilizers production at "KCKK Mineral Fertilizers Plant" Ltd.;

- Solid industrial wastes generation at the new unit is not envisaged, and the amount of household wastes generated at "KCKK Polimer Plant" Ltd. will remain at the current level, because operating and maintenance personnel will be allocated for the unit by means of optimization and redistribution of the plant's personnel without taking on more staff.

On the basis of the outlined assessment of the impact of the project activity upon the environment, we can state the following:

- The project involves installation of an advanced-technology unit with guaranteed environmental safety;

- The new unit will be provided with qualified personnel who have experience in handling similar chemical substances and wastes;

[14] Maximum permissible maximum one-time concentration.

- The project envisages environmental actions which help to minimize the environmental impact (coefficient of waste gases purification being 99.99%, absence of water effluents, industrial and household wastes being within the specified limits);
- The project envisages a low-waste process of thermal destruction of GHG;
- The new unit for thermal destruction of FOC will be fuelled with hydrogen, which is a by-product of other units operating at "KCKK Polimer Plant" Ltd.;
- To ensure prompt elimination of consequences of accidents at the new unit some changes and additions will be introduced to the existing Accident Prevention and Management Plan.

Thus, the undertaken assessment of the environmental impact of the new unit shows that the impact level of the new unit for thermal destruction of GHG will be minimized and will not exceed applicable regulatory requirements.

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

As demonstrated in the EIA documentation, the environmental impact of the proposed project is insignificant.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

The procedures established for JI projects in Russia do not require obtaining stakeholders' comments. Nonetheless, the project was presented to the local authorities and to the general public.

On 21.09.2007 the local newspaper "Vperyod" published an article entitled "Let's Protect the Climate" where the plan of KCKK Polimer Plant to stop HFC23 and FS6 emissions into the atmosphere in order to contribute to climate change mitigation was presented and discussed. No comments were received by the newspaper editorial office in response to this article.

Also the Plant has received positive response from City Duma of Kirovo-Chepetsk about review of the project Environmental Impact Assessment, as part of the Stakeholders' consultation process.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

See Section B.

Annex 3

MONITORING PLAN

See Section D.

Annex 4

PROCEDURES FOR UNIT OPERATION, MAINTENANCE AND PERSONNEL TRAINING

According to the normative documents that are valid at the enterprise (Instruction OK-9-2003 "Regulations on duties and responsibilities of the plant's personnel in the area of labour protection" and "Regulations on organization of training and certification activities for specialists of organizations under control of federal authority of ecological, technological and nuclear supervision") head of the shop where the unit for thermal destruction of greenhouse gases is operated is responsible for training of the personnel operating the unit.

Before the unit has been put into operation the following technical documentation was developed at the enterprise:

1. Temporary technological schedule No. 01/65 on operating the unit for thermal destruction of greenhouse gases (enforced by the Order of the Director of the plant No. 111dated 16.03.2008);
2. Working instruction IR-80-49-08 "On operation of the unit for thermal destruction of greenhouse gases" (enforced by the Order of the Head of the shop No. 19 dated 12.03. 2008);
3. Amendment № 1 to Plan of emergencies elimination in the shop 2 PLA-1-2-90 (enforced by the Order of the Director of the plant No. 112 dated 14.03.2008).

All specialists operating the unit have passed training under "Training program for absorption operators (FOC production)". Training included inter alia meeting the requirements set forth in the documents listed above.

The personnel was instructed in an unscheduled order about labor safety that was recorded in individual labour safety logs.

Besides specialists operating the unit had training under task program "Automated management system for technological process of the unit for thermal destruction of gases".

Working instruction and amendment to the Plan of emergencies elimination were included into the programs of instructions of personnel operating the unit.

According to the requirements of the normative documents which are valid at the enterprise (OZ-144-2006 "Regulations on procedures for labour protection training and testing of knowledge of labour protection requirements for the personnel of the enterprise") operating personnel has the following time-to-time knowledge testing:

- examination in the labor safety at the working places (annually);
- examination on the Rules of industrial safety (annually);
- instruction on the working place (quarterly);
- training in all positions of the Plan of emergencies elimination (annually).

Before the unit has been put into operation all equipment had been included into the schedule of planned maintenance of the shop's equipment. According to the existing standard of the enterprise

(CO7.O10-021-2006 "Organization of planned maintenance of the equipment") the shop's engineer is responsible for the implementation of the schedule.

According to the requirements of the existing Rules of labor safety, persons responsible for operative condition and safe operation of technological pipelines and lined capacitive equipment of the unit were appointed by the Orders regulating the shop operation.

The operating personnel is responsible for maintenance of the unit's equipment in accordance with the requirements of the working instruction IR-80-49-08 "About operation of the unit for thermal destruction of greenhouse gases". The shop's specialists are responsible for maintenance and operation of the unit's equipment under the requirements of their job descriptions.

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