JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

HFC-23 destruction at JSC Halogen, Perm
Version 2.0
Date: 02 February 2009

A.2. Description of the project:

The project is aimed at destruction of the greenhouse gas with high global warming potential (GWP) – HFC23 (CHF_3). The global warming potential of HFC23 is 11 700 tons of CO_2e per ton.

The project is implemented at JSC Halogen, Perm, Perm Krai, Russia. The plant produces fluorine-containing products: fluoroplastics, fluoropolymers, and various goods manufactured from them, hydrogen fluoride, halocarbons R14 (CF4), R22 (HCFC-22), R125 (C2F5H), R318 (C4F8), chemical agents, and hydrofluoric acids. HCFC22 ($CHClF_2$) production line was put into operation in 1950s. Project annual capacity of HCFC22 production is 17 100 ton/year (2.4 ton/hour).

HFC23 is a by-product of HCFC22 manufacturing. The main source of HFC23 emissions is the HCFC22 rectification column. Other HFC23 containing waste flows are blow-offs from Monomer-4 production and R-125 production, but these flows are not considered part of the project activity because they contain hazardous substances and therefore must be destroyed according Russian legislation.

Gaseous emissions are covered by permits to ensure that the Maximum Permissible Concentration of any given substance (MPC) is not exceeded. The enterprise has the official "Permit for emission of pollutants to the atmosphere", which includes HFC23 emissions. Under the current HCFC22 production levels, the entire amount of HFC23 wastes from the rectification column could be emitted to the atmosphere without exceeding any public health standards set for HFC23 because this gas is classed as a low-hazardous. Nonetheless, having some excess capacity for destruction of fluorine organic compounds (FOC), the enterprise captures and destroys a part of its HFC23 emissions, on a purely voluntary basis. However, it is not possible to destroy the entire amount of HFC23 in the existing installation since the plant is required to destroy much more toxic wastes, and to always prioritize these above HFC23

The project consists in the reconstruction, modernization and the effective destruction capacity enhancement of the existing FOC thermal destruction installation consisting of 3 destruction units by reducing maintenance downtime thereby increasing the number of hours which the units can run in any given year. This enables the enterprise to destroy the entire amount of HFC23 which is produced.

The scope of the project includes a number of measures:

- modernization of the incinerator control system, based on continuous information of furnace temperature through dedicated thermocouples;
- relocating the waste injection jets, to increase the residence time in the furnace proper thereby maximizing the destruction efficiency;
- relining the furnaces to withstand the harsh environments in which the operate and increase run time;
- improvement of exhaust gas processing equipment, incl. metal gas pipes replacement by plastic ones, replacement of reagents spraying control and supply system;
- installation of backup auxiliary equipment (standby pumps, gas-blowers, exhaust fans) which allows management to take the equipment out for planned maintenance or during a forced outage, without having to shut down the entire unit;

- installation of a receiver tank (E-5) in order dampen pressure fluctuations in the HFC23 blow off waste flow to improve flame stability, which is paramount to ensure high combustion efficiency. The vessel also serves as a temporary waste gas holding device, in the event the unit processing the waste is interrupted, thereby enabling operations to reroute the waste to another of the waste destruction units;
- construction of waste feeding pipelines from the HCFC22 production line to the receiver and from receiver to the thermal destruction installation;
- installation of monitoring equipment (flow-meters and chromatographs) to monitor key operating parameters necessary to quantify the emissions reductions achieved by the project activity.

The thermal destruction installation is fuelled with natural gas. HFC23 will be co-destroyed with gaseous wastes from tetrafluoroethylene (monomer-4) production line, the flow of which is measured separately. The technology and equipment were developed by a specialized institute. All technology and equipment are certified in compliance with the Russian industrial safety standards and meet all applicable environmental requirements. The technology is described in detail in Section A.4.2.

As a result of the project the entire quantity of HFC23 emissions will be destroyed.

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 benefits to the enterprise and therefore there are no other incentives for its implementation.

In April 2007, JSC Halogen and Camco International signed the Carbon Asset Development Agreement. The design works on the FOC destruction unit are planned to be conducted November through December 2007. Furnace modernization, installation of new pipe work, vessel, auxiliary equipment, and instrumentation and controls, as well as testing are planned to be completed in December 2007.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Russian Federation (host Party)	JSC Halogen	No
United Kingdom of Great Britain and Northern Ireland	Private company CAMCO International Ltd	No

JSC Halogen, one of the largest chemical enterprises in Russia, was established in Perm in 1942. Currently JSC Halogen employs over 2.5 thousand highly-qualified workers. Aspiring to work for community's welfare, the enterprise contributes to the improvement of Perm's social sphere. The enterprise pays much attention to environmental issues and has it own environment improvement agenda. JSC Halogen fulfilled the obligations of Vienna Convention of 1995 (on Protection of the Ozone Layer) and Montréal protocol of 1987 (on Emission of Ozone-Depleting Substances) by having, in due time, discontinued production of ozone depleting halocarbons and having switched to production of ozone friendly ones. Provision of normal work conditions, protection of personnel and public health are JSC Halogen's priorities.

Now JSC Halogen is one of the Russian market leaders in production of unique fluorine-containing products: fluoroplastics, fluoropolymers, and various goods manufactured from them, hydrogen fluoride, halocarbons 14, 22, 125, 318, chemical agents, and hydrofluoric acids. Produce of JSC Halogen is purchased by enterprises of Western Europe, America and Asia.

In 2003 International Quality Management System as per IC ISO 9001:2000 was established at JSC Halogen. In 2006 its functioning was certified by Accreditation Body TÜV CERT (Germany) according to results of accreditation audit (Certificate No. 15 100 21322 dated 29 November 2006).

Camco International Limited is a Jersey based public company listed at AIM in London. Camco International is the world leading carbon asset developer and projects promoter under both joint implementation and clean development mechanisms of the Kyoto Protocol. Camco's project portfolio consists of more than 100 projects, generating altogether about 135 Mt CO_2e of GHG reductions all over the world. Camco operates 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.:

Perm Krai

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

The city of Perm

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

The project activity is located Perm. Perm is a city in the European part of Russia, the administrative centre of Perm Krai, a port on the Kama River. The population of Perm as of January 2007 stood at 970 000 people.

Geographic latitude: 58°01′N. Geographic longitude: 55°53′E. Time zone: GMT +5:00.

The climate of Perm is continental. Average summer and winter temperatures are +20.5°C and -17.5 respectively. Average air humidity is 75%. Average snow cover depth is 55 cm.

Perm is the largest economic centre of Perm Krai and one of the largest economic centers in Russia. The city economy is characterized, primarily, by developed heavy industry. Core industries are power engineering, oil and gas processing, machine-building, chemical and petrochemical industries, woodworking, printing and food industry.

Fig. A.4-1. The map of Eastern Europe

Figures A.4-2 and A.4.3 show the exact location of the JSC Halogen's installations in which the project activity is to be implemented

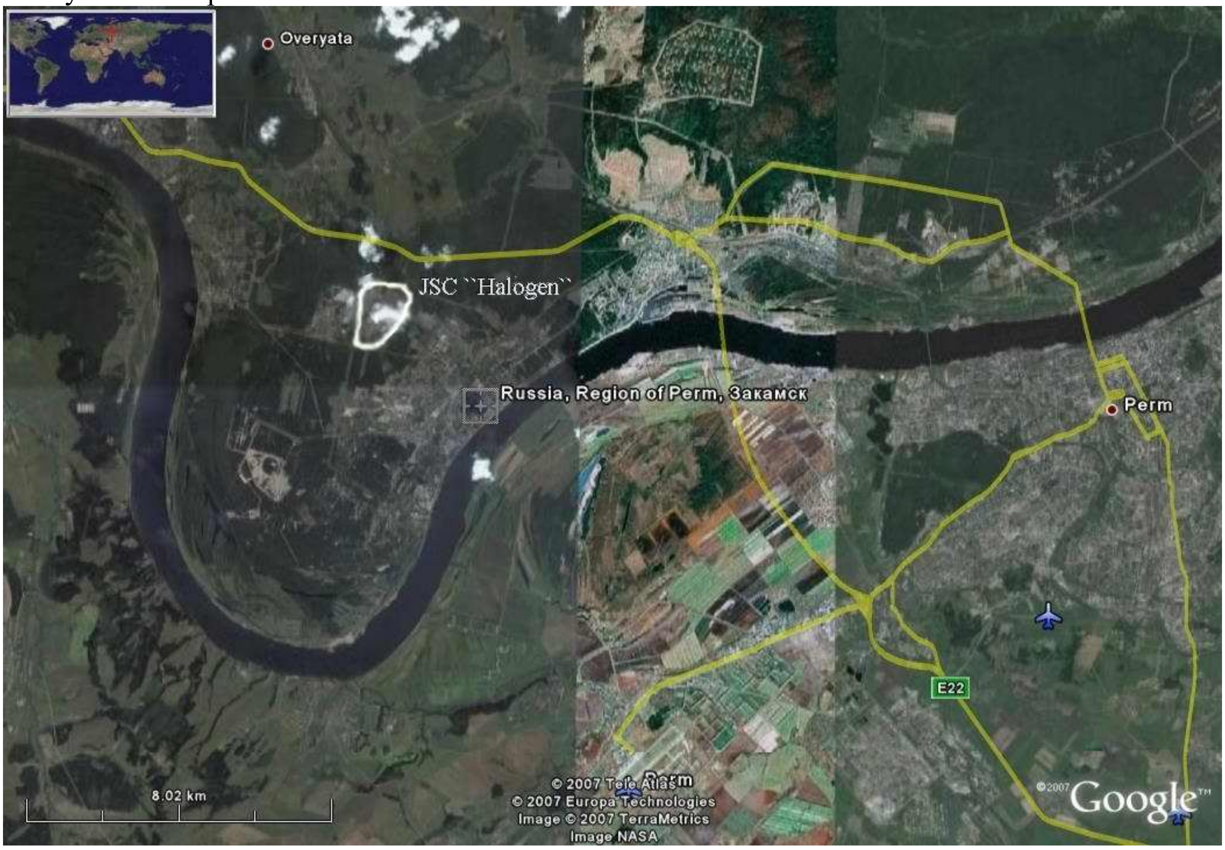


Fig. A.4-2. Location of JSC Halogen

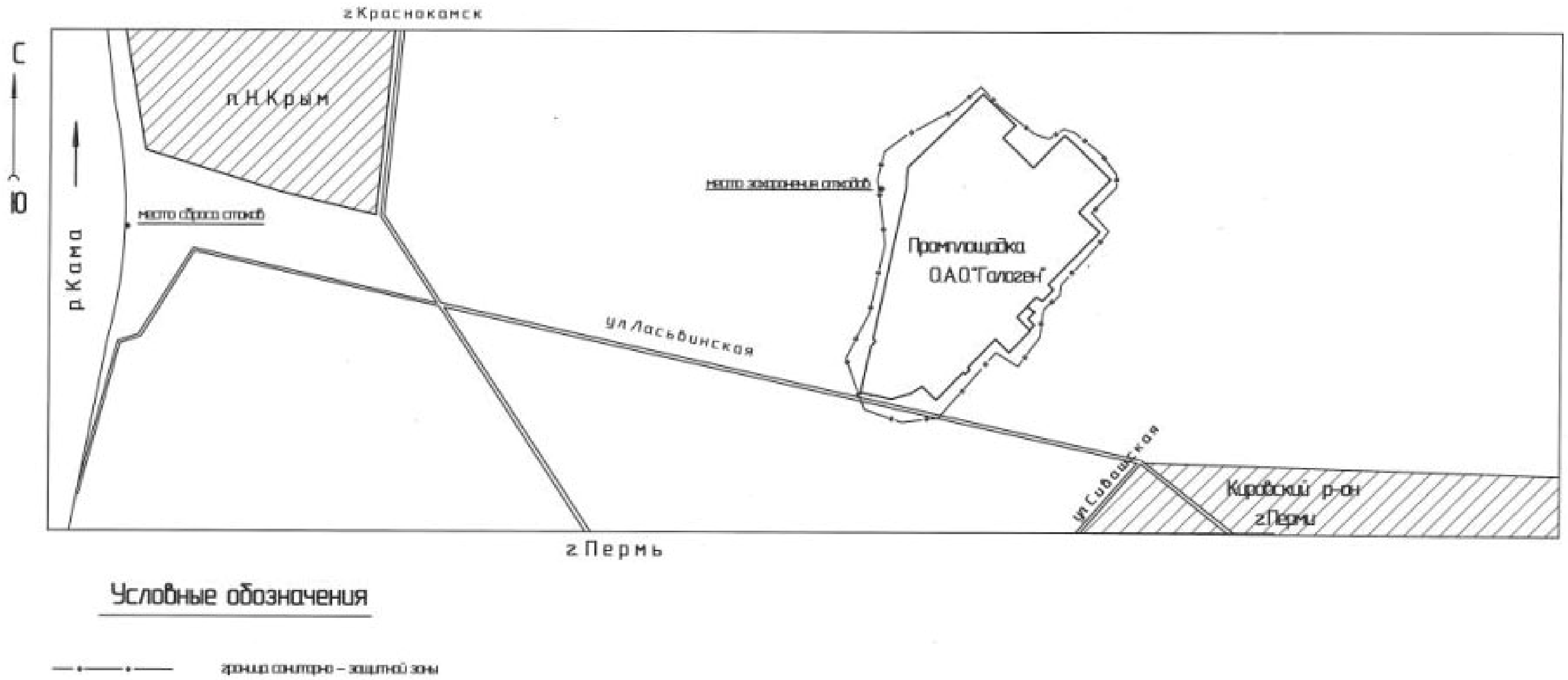


Fig. A.4-3. Nearby surroundings of JSC Halogen

Ситуационный план	**Layout**
С	N (North)
Ю	S (South)
OJSC “Halogen” facilities	
ОАО «Галоген»	OJSC “Halogen”
Промплощадка ОАО «Галоген»	OJSC “Halogen” industrial site
Место захоронения отходов	Wastes storage site
место сброса стоков	Water discharge site
Условные обозначения	**Legend**
санитарно-защитной зоны	Sanitary-protection zone

Geographical sites	
г. Пермь	Perm city (direction)
г. Краснокамск	Krasnokamsk town (direction)
п.Н.Крым	Crimea district (of the Perm city)
р.Кама	The Kama River
Кировский район г. Перми	Kirovskiy district, Perm city
ул. Сивашская	Sivashskaya street
ул. Ласьвинская	Lasvinskaya street

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

In the process of HCFC22 manufacturing, two principal by-products are generated: HFC23 and HCFC21. However, HCFC21 can be returned to the production cycle, whereas HFC23 is associated with unrecoverable losses of raw material. The enterprise undertook some measures to reduce the amount of HFC23 that is generated as part of the HCFC22 production process, thereby reducing the HFC23 to HCFC22 generation ratio and thus the amount of HFC23 waste that was generated.

With HCFC22 project production capacity 17 100 ton/yr (2.4 ton/hour) average annual output of HCFC22 varies between 6 and 12 thousand tons, HFC23 generation ratio was at 1.30 to 1.58% of HCFC22 output by weight. For example, in 2006, HCFC22 output amounted to 11 745 tons, with HFC23 output being only 158 tons that gives 1.35%.

The enterprise has relevant experience of FOC destruction. Thermal destruction units for fluorine organic compounds were installed at JSC Halogen and have been successfully operated since 1987. All equipment and technology are certified in compliance with the Russian standards and meet all applicable environmental requirements. JSC Halogen is obliged to destroy the following waste flows, due to their high toxicity levels:

Liquid wastes

1. Still bottoms (residues) with increased water concentration from monomer 4 production; and still bottoms (residues) from HCFC 22 production;
2. Still bottoms (residues) from monomer 4 production, after R-318C and R-124a have been extracted;
3. Still bottoms from R-125 production;
4. Waste compressor oil contaminated with fluorine-containing products and liquid waste with methanol content from workshop No 26.

Gaseous wastes:

5. R-125 and halocarbon-318C blow-offs;
6. Monomer 4 production blow-offs,

HFC23 containing blow-offs from HCFC22 rectification column (column K94) are partially fed as well to the destruction installation, but their amount depended on the available destruction capacity and pressure in the line at any given point in time. Total destruction capacity of the installation before the project implementation was 1290 t/yr. Volume of destructed FOC varied significantly, average amount of destructed HFC23 was about 110 tons per year. The excess blow-offs flow from the HCFC22 production was released into the atmosphere through centralized ventilation system. Amount of destructed FOC fluctuated depending on production of HCFC22, Monomer-4, R-125 that varied during the years. JSC Halogen has increased its HCFC22 and Monomer-4 production capacity up to the project capacity and amount of FOC to be destroyed increased respectively.

Russian regulation does not require destruction of any amount of HFC23 and if the current situation continues it will not be possible to destroy HFC23 containing blow-offs from HCFC22 production due to high loading of the units with more toxic wastes as compared to HFC23, which are fed to the unit from other production lines. In this case almost entire amount of HCFC22 blow-offs containing HFC23 will be vented into the atmosphere.

Within the framework of HFC23 destruction project the following measures were implemented:

- construction of waste feeding pipelines from the HCFC22 production line to the receiver and from receiver to the thermal destruction installation;
- installation of a receiver tank (E-5) in order dampen pressure fluctuations in the HFC23 blow off waste flow to improve flame stability, which is paramount to ensure high combustion efficiency. The vessel also serves as a temporary waste gas holding device, in the event the unit processing the waste is interrupted, thereby enabling operations to reroute the waste to another of the waste destruction units;
- modernization of the incinerator control system, enabling tighter control of furnace operating temperatures to ensure appropriate conditions exist in the furnace to adequate destruction efficiency;
- relocation of the waste injection jets, to increase the residence time in the combustion zone from 1.877 sec to 2.429 sec thereby maximizing the destruction efficiency;
- incinerator furnace lining improvement: more chemically resistant refractory lining in combustion burning chamber, thereby increasing the resistance to chemical attack and wear, thereby extending unit run time and reducing the maintenance downtime, higher resistant materials used for the burner components – NiCrMo steel, enabling longer and more reliable burner operation;
- improvement of exhaust gas processing equipment, incl. metal gas pipes replacement by plastic ones, replacement of reagents spraying control and supply system;
- installation of backup auxiliary equipment (standby pumps, gas-blowers, exhaust fans) which allows management for instance to take a pump out of service for planned maintenance or during a forced outage for repair, without having to shut down the entire destruction unit. This enables management to align the spare pump and avoid disrupting operation, thereby increasing the units' annual run time;
- installation of monitoring equipment (flow-meters and chromatographs) to monitor key operating parameters necessary to quantify the emissions reductions achieved by the project activity.

The applied FOC destruction technology was developed by the State Institute of Applied Chemistry (Saint-Petersburg); the equipment was designed, manufactured and supplied by local companies.

The technology has the following characteristics:

- Excellent burning at high temperatures in the combustion zone;
- Design of the burner ensures good mixing of hot gases and wastes in a turbulent flow;
- Stable and quick gas quenching to minimize dioxins;
- Excellent reliability and durability of the unit elements ensured by application of the fittest material.

The wastes destruction installation consists of 3 identical units. A simplified flow diagram of the installation operation is given in Fig. A.4-4.

One of the units is dedicated for HCFC22 and Monomer-4 blow-offs destruction. Other units are operating for destruction of other FOC.

Operation of destruction unit for decomposition of HFC23 containing blow-offs from HCFC22 and monomer-4 production

The process flow scheme of the unit is shown in Fig. A.4-5.

HFC23 containing waste flows from the rectification column K-94 of HCFC22 production line are fed under the pressure of up to 0.5 MPa to the receiver tank E-5 and from there on to the incinerator furnace

A-80. The waste flow and composition are monitored at the outlet of K-94 and at the inlet of the thermal destruction unit by chromatographs. Two mass flow meters are installed on the HFC23 waste flow line.

HFC23 containing waste flow from HCFC22 production has the following average composition, in percentage by weight:

Inert substances –	4.40%
CO_2 –	0.06%
HFC23 –	72.13%
HCFC22 –	20.59%
HCFC21 –	2.67%
HFC32 –	0.04%
HFC31 –	0.11%

Wastes flow from tetrafluoroethylene (monomer-4) are transported through a metering unit to the receiver tank E-3 under the pressure of up to 0.15 MPa and are further fed to the thermal destruction unit via a separate pipeline. In order to ensure safe operation of the pipe which transports monomer-4 wastes, a flame arrester OP-387 is installed. The waste flow from monomer-4 production line is measured with a flow meter.

Waste flow from monomer-4 production line has the following averaged composition, in percentage by weight:

Monomer-4 –	74 - 76%
CO_2 –	0.3 - 0.4%
HFC23 –	4.2 - 4.7%
Monomer-6 –	0.3%
HFC12 –	0.7%
HCFC22 –	15-18%
N_2 –	0.7-0.9%

Thermal decomposition of wastes containing HFC23 and monomer-4 is performed in the thermal destruction unit at a temperature not less than 1100º C. The unit is composed of a horizontal section – incineration zone and a vertical section – oxidation zone. The fuel used is natural gas. Air is provided under forced draft by gas-blower B-82.

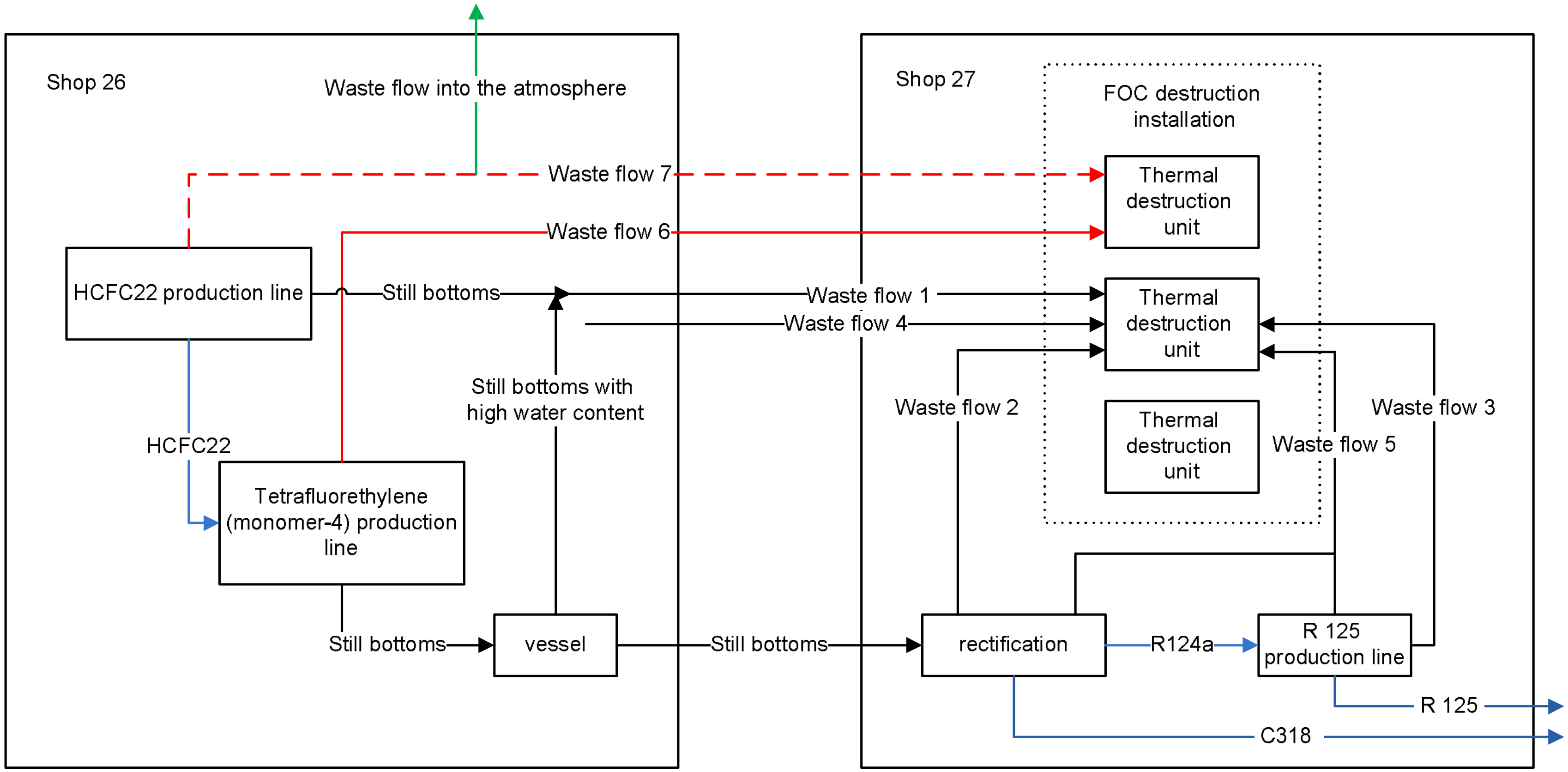
The air is fed to the units cooling jacket to cool the casing and thereafter supplied via a distribution header to the burners, to the oxidation zone to ensure full oxidation of intermediate combustion products and also for flue gas cooling. Natural gas is fed via a common pipe to the corresponding burners. Two tailor-made burners are installed in the furnace extension, to ensure adequate mixing and to impart a swirling motion to the products of combustion.

Products of waste decomposition, at around 800 $^{\circ}$C are fed from furnace A-80 to the first stage of exhaust gas processing to high-temperature absorption tower K-151. The absorption tower consists of a hollow metal column and has three rows of sprayers. Alkaline solution pumped from tank E-154 by centrifugal pumps H-156/1-3. A portion of the solution evaporates and is carried over with the gases, whereas the remainder is returned by gravity to tank E-154/1. Tank E-154/1 is replenished with spraying solution from the second stage of gas processing by pumps H-156/4,5 or with fresh makeup alkaline solution. Gases in absorber K-151 are thus purified and cooled simultaneously.

The gases partially purified and cooled down to a maximum temperature of 90 ^{0}C and are fed to the second stage of processing to absorption tower K-152. The absorber is a hollow metal column lined on the inside with graphite tiles and has three rows of spraying nozzles. Alkaline solution is fed to the nozzles by centrifugal pumps H-156/4,5 from tank E-154/2. The surplus spraying solution is discharged from absorption tower K-152 to tank E-154/2 by gravity. After purification in absorption towers K-151 and K-

152 combustion products are discharged to the stack by exhaust fan B-155. Gas composition after the induced draft fan is determined by analytical and chromatographic methods.

Spent caustic solution from tanks E-154/1,2 is fed to collector E-48 and further pumped by pump H-49 via a line to the neutralization shop for further processing to render it safe. After neutralization and clarification, the effluents are diluted with storm water and are discharged as industrial effluents to the Kama River. The laboratory at JSC Halogen undertakes regular environmental monitoring of the effluent composition.



HFC23 containing blow-oofs from HCFC22 production

Blow-offs from Monomer 4 production (containing HFC23), which were always (before and after the project implementation) destroyed in the FOC destruction installation

Raw materials/ products

Before the project implementation some amount of waste blow-offs from HCFC22 rectification was emitted into the atmosphere

Waste flows

Fig. A.4-4. Flow diagram of wastes thermal destruction

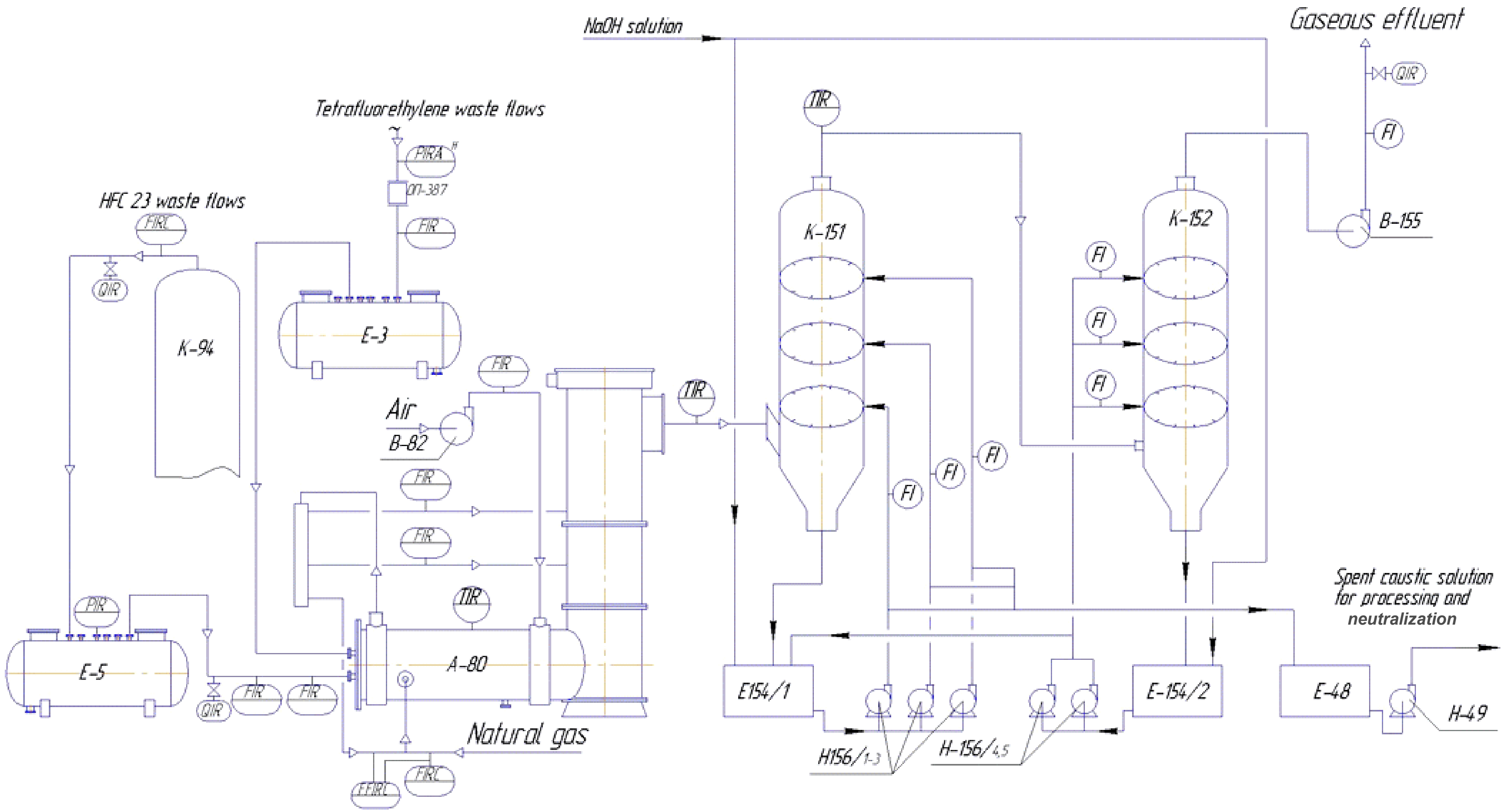


Fig. A.4-5. The process flow diagram of a thermal waste destruction unit

The project implementation will enable the destruction of the entire HFC23 from the HCFC22 rectification column, as well as gaseous wastes from tetrafluoroethylene (monomer-4) production line. This would lead to reduction of greenhouse gases emissions.

The applied technology of FOC destruction provides for wastes utilization with efficiency of up to 99.99% with virtually no dioxins generated (which is proved by direct measurements) and without any significant environmental impact, and it is the best available technology.

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 the entire amount of waste HFC23 generated from HCFC22 production. Taking into account the high GWP values of these gases, the project will result in significant mitigation of adverse anthropogenic impact upon the climate system, i.e. in reduction of GHG emissions measured in tons of CO_2 equivalent.

The enterprise has the official "Permit for emission of pollutants to the atmosphere", which includes HFC23 emissions. Currently the enterprise emits significant amounts of its HFC23 containing wastes. Since 1991 the enterprise, having had some excess FOC destruction capacity, destroys a part of the HFC23 waste gas. However, it is not possible to destroy all HFC23 wastes in the existing system. Under the current HCFC22 production level the entire amount of HFC23 wastes from the rectification column could be emitted to the atmosphere without exceeding any public health standards set for HFC23. The enterprise has no experience of recovering HFC23 for sale.

Without the JI project implementation, the plant would have continued to release HFC23 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 these emissions. HFC23 is ranked as the 4th hazard class, i.e. is considered virtually harmless for the environment and human health.
2. HFC23 is a greenhouse gas and is 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 destruction process entails significant 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 waste produced in the existing installation, because it currently destroys many other more toxic wastes from manufacturing of tetrafluoroethylene, difluorochloromethane (HCFC22), pentafluoroethane (HFC125), octofluorocyclobutane (Halocarbon 318C), fluoroplastics and the priority is obviously given to the destruction of these highly toxic substances.
5. Even though HFC23 emissions are restricted in Russia, fines or other payments are not set for emissions of these substances. In fact JSC Halogen could release the entire volume of HFC23 produced without exceeding the maximum concentration limits MPC

The project is not common practice in Russia. Typically, a plant which has an established limit of maximum permissible emissions 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 tons of CO_2 equivalent
2008	529 024
2009	528 951
2010	528 907
2011	528 864
2012	528 868
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	**2 644 614**
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	528 923

A.5. Project approval by the Parties involved:

According to the Russian legislation the letter of approval will be issued by the Russian Government on the basis of an expert statement issued by AIE after the project has been determined against the JI criteria and requirement set forth on both international and domestic level.

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 05.2* "*Incineration of HFC23 waste streams*", in effect since December 3, 2007 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 JSC Halogen;
- HCFC22 production facility was launched in 1966, and was in operation between 2000 and 2004 and from 2005 until now;
- HFC23 destruction unit is located on the territory of JSC Halogen;
- Russian laws and regulations do not require destroying of the total amount of waste HFC23.

Still it appeared necessary to refine the methodology in relation to determination of the baseline quantity of HFC23 destroyed. This is due to the specifics of emissions regulation in the Russian Federation, which is further considered in more detail.

The formula for emission reductions calculation[1] is as follows:

$$ER_y = \left(Q\_HFC23_y - B\_HFC23_y\right) \times GWP\_HFC23 - E\_DP_y - L_y, \qquad \text{(B.1-1)}$$

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;

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

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

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 value is subject to thorough monitoring. Furthermore, the mass balance equation is to be observed, which for the project scenario is as follows:

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

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

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

[1] The original formula (1) of CDM methodology AM0001/Version 05.2

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

G_HFC23_y value will be monitored.

The company has never recovered HFC23 for sale and has no such plans, therefore in the forecast $S\_HFC23_y = 0$. Nonetheless, S_HFC23_y value is subject to monitoring.

In estimations it is acceptable to assume that HFC23 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.

In accordance with AM0001/Version 05.2 methodology, to exclude the possibility of manipulating the production process to increase the quantity of waste, the following *cut-off condition* is set:

$$G\_HFC23_y \leq MIN\left\{P\_HCFC22_y;\ P\_HCFC22_{Hist,\max}\right\} \times w_h, \tag{B.1-3}$$

Where P_HCFC22_y is the actual (as monitored) or planned (as projected) production of HCFC22 at JSC Halogen during the year y, t;

$P\_HCFC22_{Hist,\max}$ is the actual maximum annual production of HCFC22 at the plant over a historical period[2], t. For $P\_HCFC22_{Hist,\max}$ we take the maximum annual volume of HCFC22 production at JSC Halogen over the period 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 JSC Halogen over the period 2002-2004;

According to AM0001/Verion 05.2 methodology, the quantity of HFC23 destroyed under the baseline is equal to 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 tons during the year y as follows[3]:

$$B\_HFC23_y = Q\_HFC23_y \times r_y, \tag{*}$$

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 very amount of HFC23 emissions to the atmosphere in absolute expression. This index is called the "specified level of maximum permissible emissions", or MPE.

Russian Emission Regulations

Local Russian legislation limits the amount of pollutants, including HFC23 that can be released to atmosphere in a given year. It does so however not by defining the fraction of the waste produced that needs to be destroyed, but rather by limiting the amount that can be released to atmosphere. These limits are given in tons of pollutant that can be discharged in a given year.

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[2] According to AM0001/Version 05.2 methodology, the historical period is any of the last three years between the beginning of 2000 and the end of 2004

[3] Formula (4) of CDM methodology - AM0001/Version 05.2

The main 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 this law, pollutants from stationary sources can only be discharged to the atmosphere if the emitters have a permit to do so. The emitter must have an official “Permit for emission of pollutants”, regardless of the amount or toxicity level of the pollutant which is emitted.

In order to determine how much gaseous waste an industrial facility may emit in a given year, industrial facilities submit an “Emissions card” in which they indicate the type, source and quantity of pollutant they expect to discharge. The Perm City Interregional Agency for Technological and Environmental Supervision (Rostehnadzor) then calculates the quantity of pollutant that each industrial facility may release to the atmosphere such that the Maximum Permissible Concentration level of the pollutant (MPC) in question is not exceeded. It does so by applying a dispersion model which takes into account the various sources of such pollutants and the quantities that are anticipated to be produced in the coming year, to determine the concentration of that specific pollutant at specific locations. The above named environmental authority then allocates the amount of pollutant each company is entitled to emit over the coming year. The amount of emissions that each industrial facility is allowed to release to atmosphere is known as the “Maximum Permissible Emission level” or MPE. The permit containing the emitter’s MPE is issued if the emitter has a special document, “MPE log”, which is prepared by the emitter and submitted for approval to the environmental agency at least once every five years. This document justifies the expected levels of pollutant emissions per unit time (g/s, t/y) stated by the emitter for each of its stationary sources and for each pollutant, and provides the necessary inputs to the dispersion model which is used to determine if the concentration levels of the pollutant in question are acceptable or not, and therefore if any destruction is required.

It should be noted hat the MPE logs in Perm are developed on a yearly basis for the city’s industry as a whole and the corresponding permits with the corresponding MPEs are issued for individual enterprises as described above.

The first and the main condition in setting the MPE level for the source is non-exceedance of 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.

However, companies in the region may request that their MPE levels be raised to accommodate increased pollutant generation associated with increased production levels. In order to do so, the company must indicate what emissions are projected to increase and to prepare what is knows as an “Emission Updating Card”. This card is then submitted to Rostenhnadzor, which then assesses the impact of such changes on the pollutant concentration levels. Rostenhnadzor can issue a new MPE permit that will enable to the company to increase its emissions levels, provided its meets its criteria and the pollutant’s MPC levels are not exceeded. Depending on the toxicity class of the pollutant the emitter may have to pay or not a certain amount of money for the emissions, even if these are permitted, that is, even if they are such that they do not result in the Maximum Permissible Concentration level being exceeded.

Although legislation does exist to restrict the amount of HFC23 that can be discharged, in practical terms the levels of HFC23 waste production and the Maximum Permissible Concentration limit are such that even under the most optimistic of scenarios for HCFC22 production, the amount of HFC23 produced could be discharged to the atmosphere without the need for destroying any fraction of it whatsoever.

This means that the JSC Halogen is not required to reduce emissions of HFC23 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 and/or the plant discontinues destruction of HFC23, higher levels of MPE can be set for the plant[4]. Furthermore, HFC23 is classed as a category 4 pollutant, and thus

[4]According to Russian regulations the destroyed substance is 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

considered to be non toxic and exempt of any pollution levy, as opposed to other toxic pollutants. Hence JSC Halogen is neither obliged by law to destroy nor has any costs reduction incentive whatsoever to destroy any HCFC23 that is generated in its facilities.

HFC23 destruction under the baseline

However, following the conservative approach, for the baseline scenario we assume that JSC Halogen would have continued to release HFC23 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 for this project was determined on the basis of the lowest historical levels of Permits obtained by JSC Halogen in 2002-2004.

In view of the above stated, the baseline quantity of HFC23 destroyed during the year *y* is proposed to be calculated on the basis of mass balance of HFC23 wastes as follows:

$$B\_HFC23_y = G\_HFC23_y - S\_HFC23_y - MPE\_HFC23_{Hist,\min}, \qquad \text{(B.1-4)}$$

Where $MPE\_HFC23_{Hist,\min}$ is the minimum level of the issued permit for emissions of HFC23 from the sources within the project boundary (rectification column of HCFC22 production line) during the year according to historical data (2002-2004), t.

The value of B_HFC23_y can not be negative, therefore if the amount of generated HFC23 is equal or less than the value of $MPE\_HFC23_{Hist,\min}$, the enterprise could without any obstacles release the total amount of the remaining HFC23 to the atmosphere and would not have to destroy any of it. Therefore:

$$\text{if } G\_HFC23_y - S\_HFC23_y \le MPE\_HFC23_{Hist,\min}, \text{ then } B\_HFC23_y = 0. \qquad \text{(B.1-5)}$$

GHG emissions from destruction of HFC23 wastes during the year *y* are calculated using the following formula, t CO_2-e:

$$E\_DP_y = ND\_HFC23_y \times GWP\_HFC23 + FC_y \times EF_f + Q\_HFC23_y \times EF_h, \qquad \text{(B.1-6)}$$

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

FC_y is natural gas consumed for the destruction process during the year *y*, m^3;

EF_f is the emissions factor which determines the amount of CO_2 generated in combustion of natural gas. Emission factor for natural gas supplied to JSC Halogen by Gazprom Transgaz Chaykovskiy, LTD is EF_f = 0.00187 t CO_2e/m^3(20 °C);

EF_h is the emissions factor which determines the amount of CO_2 per 1 ton of destroyed HFC23. According to CDM methodology AM0001, EF_h = 0.62857 t CO_2e/t.

ND_HFC23_y value will be monitored under the project. For estimations it is acceptable to assume that the fraction of HFC23 does not exceed 0.01% of Q_HFC23_y.

(tentative safe exposure level) in air in a populated area for HFC23 are 3000 mg/m^3 and 10 mg/m^3, respectively. Actual concentrations of HFC23 at the boundary of the sanitary protection zone and at monitoring points of the residential area do not exceed 0.03 parts of MPC even if the entire quantity of waste HFC23 is emitted.

Natural gas consumption will be metered. In the forecast natural gas consumption is estimated as per natural gas consumption norm per ton of destroyed substance:

$$FC_y = fc \times Q\_HFC23_y, \qquad \text{(B.1-7)}$$

where fc is the specific natural gas consumption norm per ton of destroyed substance, m^3/t. According to the enterprise's data $fc = 330$ m^3/t.

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

$$L_y = EC_y \times EF_{CO2,grid,y} \times 10^{-3} + StC_y \times EF_{st}, \qquad \text{(B.1-8)}$$

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

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

StC_y is the steam consumption for FOC destruction process during the year y, GJ;

EF_{st} is the CO_2 emissions factor for consumption of steam supplied from the municipal CHP plant, t CO_2/GJ.

Electricity consumption will be calculated on the basis of specific electricity consumption norms monitored in compliance with the monitoring plan. Consumption norms are developed annually by the Department of Chief Energy Engineer and Technical Department on the basis of actual annual data and are approved by the Chief Engineer of the enterprise.

$$EC_y = ec \times Q\_HFC23_y, \qquad \text{(B.1-9)}$$

where ec is the specific norm of electricity consumption per ton of destroyed substance, kWh/t. According to the data provided by the enterprise ec =2 135 kWh/t.

According to the *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 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.

Steam consumption will be metered. In our projections steam consumption is estimated according to consumption norms per ton of destroyed substance:

$$StC_y = stc \times Q\_HFC23_y, \qquad \text{(B.1-10)}$$

Where stc is the consumption norm of steam consumption per ton of destroyed substance, GJ/t. According to the enterprise's data stc = 1.05 GJ/t.

The steam will be supplied from the nearby CHP plant. In calculations of GHG emissions due to steam consumption, natural gas was assumed as the fuel, and the efficiency of steam production and supply was assumed equal to 0.80.

The emission factor for the consumed steam with allowance for energy losses incurred in steam receipt and transportation is calculated as follows, t CO_2/GJ:

$$EF_{st} = 56.1 \times 0.995 \times 10^{-3} / 0.80 = 0.070 \qquad \text{(B.1-11)}$$

where *56.1* is the default emission factor for natural gas according to *IPCC 2006 Guidelines for National GHG Inventories,* kg CO_2/GJ;

0.995 is the oxidation factor for natural gas;

0.8 is the efficiency of steam production and supply from the nearby CHP plant.

It is necessary to note that, following the conservative approach, the value of Q_HFC23_y for calculation of the project emissions and GHG leakages should be taken without limitations set by the cut-off condition (B.1-3).

The outlined model built upon AM0001/Version 05.2 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 JSC Halogen are given for the period from 2002 till 2006. The projected level of HCFC22 production for the period up to 2012 corresponds to the production plans of the plant. Electricity and steam consumption norms are assumed according to the enterprise's data.

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

Designation	Unit	***2002***	***2003***	***2004***	2005	2006	2007	**2008**	**2009**	**2010**	**2011**	**2012**
P_HCFC22_y	t	6 928.4	7 245.0	**9 524.0**	11 388.0	11 745.0	14 000.0	16 397.0	18 000.0	19 000.0	19 999.0	20 009.0
$P\_HCFC22_{Hist,\max}$	t							9 524.0	9 524.0	9 524.0	9 524.0	9 524.0
$*G\_HFC23_y$	t	90.0	109.0	133.0	180.0	158.0	182.0	213,0	233,8	246,8	259,8	259,9
G_HFC23_y	t							123.7	123.7	123.7	123.7	123.7
Q_HFC23_y	t							123.7	123.7	123.7	123.7	123.7
S_HFC23_y	t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L_HFC23_y	t							0.0	0.0	0.0	0.0	0.0
B_HFC23_y	t							78.4	78.4	78.4	78.4	78.4
$MPE\_HFC23_{Hist,\min}$	t	*45.3*	*45.3*	*45.3*	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3
ND_HFC23_y	t							0.0213	0.0234	0.0247	0.0260	0.0260
w_h	%	**1.30%**	1.50%	1.40%	1.58%	1.35%	1.30%	1.30%	1.30%	1.30%	1.30%	1.30%
fc	m^3/t							330.00	330.00	330.00	330.00	330.00
FC_y	m^3							70 289,1	77 160,7	81 447,4	85 729,8	85 772,7
stc	GJ/t							1.05	1.05	1.05	1.05	1.05
StC_y	GJ							223,0	244,8	258,3	271,9	272,1
ec	kWh/t	2 600	2 400	2 140	2 140	2 135	2 135	2 135	2 135	2 135	2 135	2 135
EC_y	MWh							455	499	527	555	555
$EF_{CO2,grid,y}$	kg CO_2/MWh	612	604	596	588	581	573	565	557	550	542	534

* values were determined without applying the cut-off condition (B.1-3)

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 05.2 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 in the existing installation for thermal destruction of FOC;

Alternative 3: Selling of HFC23 as a commercial commodity;

Alternative 4: The project activity as not JI.

Each of the alternatives is considered in detail below.

Alternative 1: Continuation of the existing situation

A portion of the HFC23 waste generated is destroyed in the existing units for thermal destruction of FOC but only after all the toxic substances that have to be destroyed in compliance with Russian regulations are destroyed. The existing thermal destruction installation is fully operational and can be operated in normal mode without any significant financial investments and modernization, at least until 2012.

This situation is bound to continue in the future since the enterprise does not violate any standards and has a valid emissions permit for the relevant sources. Furthermore, the release of HFC23 to atmosphere is a common practice not only in Russia but in other countries as well, such as developing countries in which such emissions are not regulated at all.

Though the enterprise has a defined MPE level for HFC23, it can be increased, because the Maximum Permissible Concentration limit (MPC) was not reached. In fact, even if all the forecasted production of HFC23 were to be released to atmosphere, the MPC level would not still be reached, and thus a permit to release such amount could readily be awarded.

Even though HFC23 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 on default as the baseline scenario by AM0001 methodology.

Thus, *Alternative 1 can be considered as the most likely baseline scenario*.

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

The existing installation for thermal destruction of FOC is designed for destruction of hazardous wastes (FOC) in amount produced by the plant operating at the project capacity. In case the plant operates at lower load and therefore with lower toxics wastes formation, the installation will have some spare capacity available for destruction of the non toxic HFC23 obtained from HCFC22 production. However the installation does not have the capacity to destroy the entire amount of HFC23 waste generated, and must always give priority to destroy those wastes that are toxic.

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

Alternative 3: Selling of HFC23 as commercial commodity

The plant has never produced HFC23 or recovered it from HCFC22 blow-off streams for commercial purposes and has not planned to do so.

The market of commercial HFC23 in Russia 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 that makes about 110 tons per year at JSC Halogen alone[5]. However the total market for HFC23 was estimated at 35 tons per year[6] and decreased considerably by 2005-2006.

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

Alternative 4: The project activity as not JI

Under this scenario, the modernisation, reconstruction and destruction capacity expansion that would be achieved is accomplished in the absence of JI. The project activity cannot be considered one which the enterprise would have done or even have to do, given the projected HCFC22 production plans. This is because:

a) JSC Halogen does not have to destroy all the HFC23 it would produce, in fact it does not have to any in order to comply with environmental legislation, because under no production scenario is the HFC23 MPC limit reached. In other words, any incremental release of HFC23 to the atmosphere can be readily covered by the issuance of a new MPE permit

b) JSC Halogen has sufficient available capacity to destroy the increased amount of toxic wastes that are expected to be produced by 2012 and which do have to be destroyed to comply with Russian regulations. In other words, it has no need to modernise, reconstruct nor expand its destruction capacity in order to handle the forecasted increase in HFC23 waste production which results from its HCFC22 production plans.

The project activity would thus not be necessary. Hence, not only does JSC Halogen not have any incentive to carryon destroying HFC23, even if it wanted to continue to do so voluntarily as it has been doing, it could not be able do so due to lack of destruction capacity of the existing system.

Thus, *implementation of Alternative 4 as baseline is unlikely.*

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

<u>Additionality analysis</u>

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

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[5] Even assuming that JSC Halogen will establish production of saleable HFC23 if the market demand increases, the sales will be first of all increased through reduction of the part of HFC23 destroyed and only then through reduction of the emissions into the atmosphere, since the emitter does not pay for HFC23 emissions, whereas destruction of HFC23 costs a lot.

[6] According to 2002 data

1. Russian regulations do not require destruction of the total amount of HFC23 emissions. HFC23 emissions are almost harmless and fines are not charged for those. There are no limitations to HFC23 emissions from enterprises in Russia and those are not expected at least until 2012.
2. At present, the common practice in Russia for the HFC23 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 efforts 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 this sphere.

Therefore in the absence of the proposed project activity it would not be possible to achieve GHG emission reductions. And the proposed project activity allows complete destruction of HFC23 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 05.2.

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

The project boundaries and principal sources of GHG emissions are presented in Fig. D.1-1.

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.**
Project activity	Emissions due to HFC23 not destroyed (leaks to air)	**HFC23**	**Incl.**	**Considered negligible, but included to be conservative.**
	Emissions due to natural gas consumption for destruction process	**CO_2**	**Incl.**	**Main source of emissions.**
		CH_4	Excl.	Considered negligibly small
		N_2O	Excl.	Considered negligibly small
	Emissions due to destruction of 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 *
Leakages	Emissions due to grid electricity supply for destruction process	**CO2**	**Incl.**	**Considered negligible, but included to be conservative.**
		CH_4	Excl.	Considered negligibly small
		N_2O	Excl.	Considered negligibly small
	Emissions due to steam consumption for destruction process	**CO2**	**Incl.**	**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 sludge	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.

** The sludge is stored at the plant sludge pit located on the plant's territory.

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 – 9 November 2007

BL was developed by the specialists of Camco International Ltd.

e-mail: russia@camcoglobal.com

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Project starting date: 06 July 2006

1st of January 2008 - commissioning of the thermal destruction installation

C.2. Expected operational lifetime of the project:

20 years/240 months

C.3. Length of the crediting period:

5 years/60 months (from the 1st of January 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 05.2 *"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 from HCFC22 production line is measured continuously by a mass flow meter installed on the outlet pipeline from the emission source (column K-94). Content of HFC23 is measured by laboratory chromatographs daily.

2. The quantity of HFC23 technological emissions fed to the thermal destruction unit is measured continuously by two down-the-line flow meters installed on the waste feeding line. Content of HFC23 is measured by laboratory chromatographs daily.

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

4. The quantity of produced HCFC22 is determined on a monthly basis as a sum of commercial HCFC22 output and HCFC22 consumption for monomer-4 production measured by level meters.

5. In case HFC23 is recovered for sale, its quantity 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).

6. Electricity consumption is measured on the basis of electricity consumption standards which are approved annually.

7. Steam consumption is measured by heat meter.

8. Natural gas consumption is measured by flow meter.

9. 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.

10. The amount of liquid effluents and their parameters (pH, COD BOD, suspended solids, fluorides and metals) are measured in the established order.

All the measuring equipment meets up-to-date standards and is subject to regular calibration. The equipment is calibrated by the special organization which is entitled to perform this type of activities. The procedures for monitoring equipment control, maintenance and repair are subject of internal plant instructions.

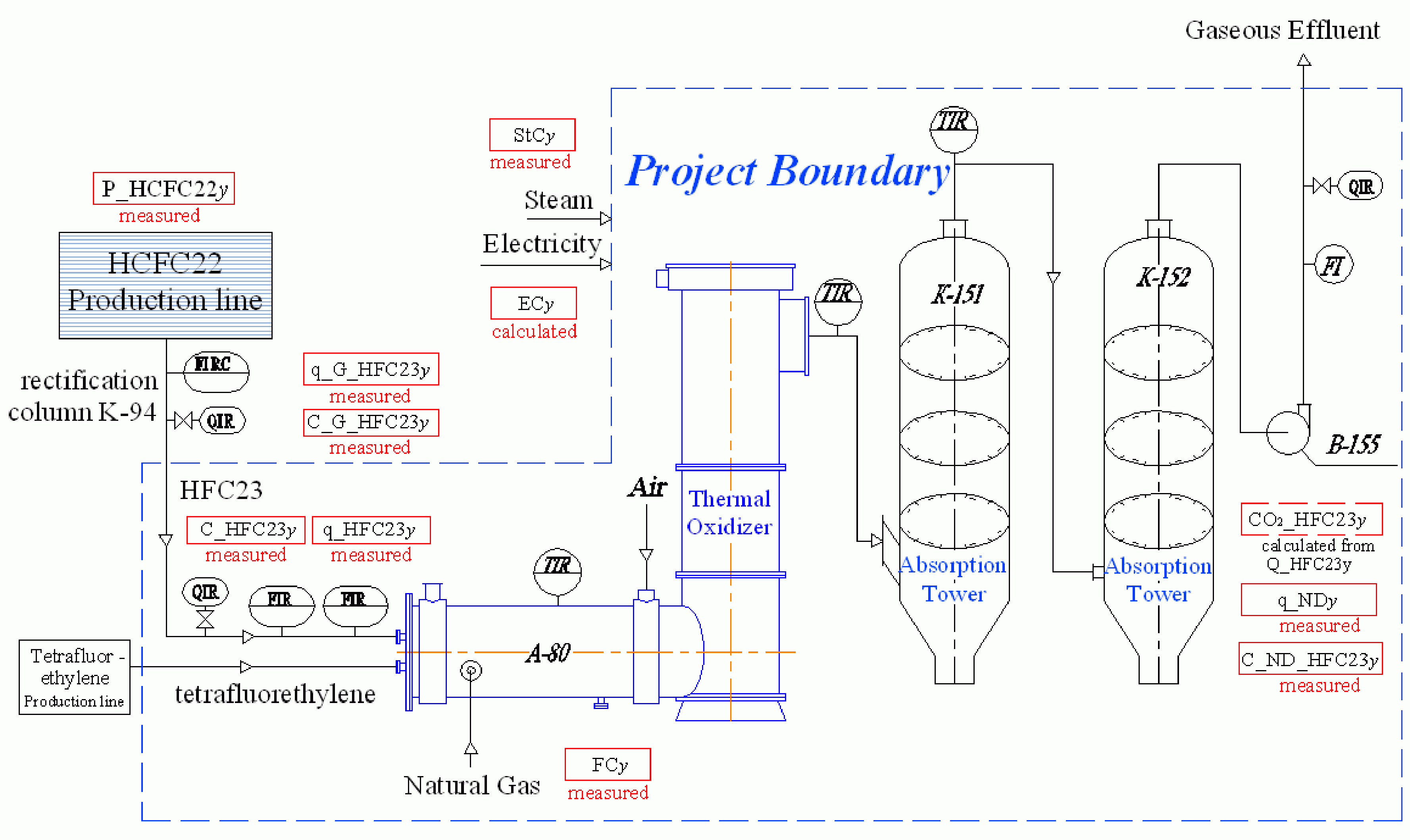

Fig. D.1-1. The scheme of monitoring

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	Once per week (continuous measurement)	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	Once per week (measured once per day)	100%	Electronic and paper	
3. FC_y	Natural gas consumption during destruction process	Flow meter	m^3	(m) Measured	Monthly	100%	Electronic and paper	
4. q_ND_y	Volume of gaseous effluent from the unit	Portable volumetric flow meter	m^3	(m) Measured	Once per week (measured weekly)	100%	Electronic and paper	Volume is measured by portable flow-meter. The amount is averaged.
5. $C\_ND\_HFC23_y$	Concentration of HFC23 in gaseous effluents from the unit	Chromatograph	mg/m^3	(m) Measured	Once per week	100%	Electronic and paper	Measured once per week. The amount is averaged .

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:

$$E\_DP_y = ND\_HFC23_y \times GWP\_HFC23 + FC_y \times EF_f + Q\_HFC23_y \times EF_h, \quad \text{(D.1-1)}$$

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

FC_y is the natural gas consumption during destruction process over a year *y*, m^3;

EF_f is CO_2 emission factor of natural gas combustion. Emission factor for natural gas supplied to JSC Halogen by Gazprom Transgaz Chaykovskiy, LTD is EF_f = 0.00187 t CO_2e/m^3(20 °C);

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

EF_h is the emissions factor that determines the amount of CO_2 generated per 1 ton of HFC23 destroyed. According to CDM methodology AM0001, EF_h = 0.62857 t CO_2e/t;

GWP_HFC23 is the Global Warming Potential (GWP) that converts 1 ton of HFC23 to tons of CO_2 equivalent, t CO_2e/t. The approved GWP value for HFC23 is 11 700 t CO_2e/t for the first commitment period under the Kyoto Protocol;

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

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

where q_ND_y is the 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_HFC23_y is the average annual concentration of HFC23 in wastes supplied for destruction during the year *y*, %;

D.1.1.3. 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	Commercial HFC23 production is not planned
7. $q\_G\_HFC23_y$	Quantity of HFC23 wastes at the outlet of rectification column K94	Mass flow-meter	kg	(m) measured	Monthly (readings are recorded weekly)	100%	Electronic	
8. $C\_G\_HFC23_y$	Concentration of HFC23 in wastes at the outlet of rectification column K94	Chromatograph	%	(m) measured	Monthly (readings are recorded weekly)	100%	Electronic and paper	
9. V_HCFC22_y	Volume of HCFC22 produced at the plant	Level meter	m^3	(m) measured	Monthly	100%	Electronic and paper	Volume is measured by level-meters in vessels once they are filled
10. P_HCFC22_y	The mass of HCFC22 produced at the plant, which is a source of HFC23 emissions		t	(c) calculated	Monthly		Electronic and paper	Calculated on the basis of volume of HCFC22 produced as measured and its density

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

At first HFC23 leaks to the atmosphere within the project boundary are calculated according to actual data during the year y, t:

$$L\_HFC23_y = G\_HFC23_y - Q\_HFC23_y - S\_HFC23_y, \tag{D.1-4}$$

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

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

$$G\_HFC23_y = q\_G\_HFC23_y \times \frac{C\_G\_HFC23_y}{100} \times 10^{-3}, \tag{D.1-5}$$

where $q\_G\_HFC23_y$ is the amount of wastes containing HFC23 at the outlet of rectification column K94, kg;

$C\_G\_HFC23_y$ is the average annual concentration of HFC23 in wastes at the outlet of rectification column K94 , %;

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

$$G\_HFC23_y \le MIN\{P\_HCFC22_y;\ P\_HCFC22_{Hist,\max}\} \times w_h, \tag{D.1-6}$$

where P_HCFC22_y is the amount of HCFC22 produced at JSC Halogen 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 JSC Halogen during the period of 2002-2004. According to Section B.1 $P\_HCFC22_{Hist,\max}$ = = 9 524.0 t (2004);

w_h is the fraction of HFC23 per unit of HCFC22 produced at the plant. For the fraction w_h we assume its minimum average annual value according to actual data of JSC Halogen during the period 2002-2004. According to Section B.1 w_h = 1.30% (2002).

P_HCFC22_y is calculated from volume of produced HCFC22 (V_HCFC22_y). V_HCFC22_y is monitored.

$$P\_HCFC22_y = V\_HCFC22_y * \rho\_HCFC22$$

where V_HCFC22_y is the amount of HFC23 at the outlet from HCFC22 production line during the year y, t;

ρ_HCFC22 is density of HCFC22 in the vessel. Concentration of HCFC22 is standard (99,9%). Density is determined at 0ºC using standard tables.

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

$$BE_y = (Q\_HFC23_y - B\_HFC23_y) \times GWP\_HFC23, \tag{D.1-7}$$

where B_HFC23_y is the baseline quantity of HFC23 required to be destroyed by applicable regulation during the year y, t;

$$Q\_HFC23_y = G\_HFC23_y - S\_HFC23_y - L\_HFC23_y, \tag{D.1-8}$$

$$B\_HFC23_y = G\_HFC23_y - S\_HFC23_y - MPE\_HFC23_{Hist,\min}, \text{ if } B\_HFC23_y < 0, \text{ then we take } B\_HFC23_y = 0, \tag{D.1-9}$$

where G_HFC23_y is the amount of HFC23 generated in HCFC22 production line with allowance for the cut-off condition (D.1-6) during the year y, t;

$MPE\_HFC23_{Hist,\min}$ is the minimum level of the issued permit for emissions of HFC-23 to the atmosphere from sources within the project boundary (HCFC22 rectification column) during the year y based on historical data (2002-2004), t. According to Section B.1 $MPE\_HFC23_{Hist,\min}$ = 45.3 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

D.1.2.2. 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:

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
11. *ec*	Specific Electricity consumption norm for destruction process		kWh/t	(c) Calculated	Monthly	100%	electronic	The Specific consumption is defined by the Department of Chief Energy Engineer and Technical Department annually based on actual data for the year and are approved by the Chief Engineer of the plant
12. StC_y	Steam consumption for destruction process	meter	GJ	(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:

$$L_y = EC_y \times EF_{CO2,grid,y} \times 10^{-3} + StC_y \times EF_{st} , \qquad \text{(D.1-10)}$$

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

$$EC_y = ec \times Q\_HFC23_y \qquad \text{(D.1-11)}$$

where *ec* is the specific norm of electricity consumption per 1 ton of destroyed substance, kWh/t.

$EF_{CO2,grid,y}$ 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.

StC_y is the steam consumption for FOC destruction process during the year y, GJ;

EF_{st} is the CO_2 emission factor for steam consumption supplied by municipal CHP plant, t CO_2/GJ. According to Section B.1: EF_{st} = 0.070 t CO_2e/GJ.

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:

$$ER_y = BE_y - E\_DP_y - L_y . \quad \text{(D.1-12)}$$

D.1.5. 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 Technical Department of JSC Halogen 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 Q_HFC23y	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.1.1.1 ID 2 C_HFC23y	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.
Table D.1.1.1 ID 5 C_ND_HFC23y	low	
Table D.1.1.3 ID 8 C_G_HFC23y	low	
Table D.1.1.1 ID 4 q_NDy	low	Flow meter is subject to calibration once in 2 years. The accuracy of the equipment has little influence on accuracy of GHG emission reduction calculations.
Table D.1.1.1 ID 3 FCy	low	Natural gas meter is checked once in 3 years.
Table D.1.1.3 ID 7 q_G_HFC23y	low	Frequency of recalibration is in compliance with the requirements of the Federal Agency for Technical Control and Metrology.
Table D.1.1.3 ID 6 S_HFC23y	low	Cross-checked with production and accounting reports.
Table D.1.1.3 ID 9 P_HCFC22y		
Table D.1.3.1 ID 10 ec	medium	Consumption standards are developed by the department of Chief Energy Engineer and Technical Department annually based on measured consumption and then calculated for each of the destroyed substances. Consumption standards are approved by the Chief Engineer of the plant.
Table D.1.3.1 ID 11 StCy	low	Heat meter is checked once in 2 years.

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

All input data is regularly collected (see Section D.1.). The Head of Technical Department and the Deputy Head of the Thermal waste destruction facility (Shop No. 27) of JSC Halogen are responsible for data submission and execution of reporting documentation under the project.

Calculations of emission reductions will be prepared by specialists of Camco International at the end of every reporting year.

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
E-mail: russia@camcoglobal.com

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The project emissions include:

- Emissions of HFC23 not destroyed (leaks with exhaust gases from the unit);
- Emissions of CO_2 associated with natural gas consumption in the destruction process;
- Emissions of CO_2 generated in the process of HFC23 destruction.

The project emissions are calculated using the formula (B.1-6, B.1-7). 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, tons of CO_2e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
HFC23	249	274	289	304	304	1 420
CO_2	265	291	307	324	324	***1 511***
Project emissions, total	**515**	**565**	**596**	**628**	**628**	**2 932**

E.2. Estimated leakage:

As shown in Section B, significant leakages are GHG emissions due to grid electricity and steam consumption required for operation of the thermal destruction unit. GHG leakages under the project are calculated using the formulae (B.1-8 … B.1-11). 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, tons of CO_2-e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
CO_2 emissions due to grid electricity and steam consumption	273	295	308	320	315	1 511

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, tons of CO_2-e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
The sum of project emissions and leakages	787	860	904	947	943	4 442

E.4. Estimated baseline emissions:

The baseline GHG emissions include:

- Emissions of HFC23 into the atmosphere avoided due to the project.

The baseline emissions are calculated using the formula:

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

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, tons of CO_2e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
HFC23	529 811	529 811	529 811	529 811	529 811	2 649 056
Baseline GHG emissions	**529 811**	**529 811**	**529 811**	**529 811**	**529 811**	**2 649 056**

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, tons of CO_2e

Value name	Reporting years					
	2008	2009	2010	2011	2012	2008-2012
CO_2	-538	-586	-615	-643	-639	-3 022
HFC23	529 562	529 538	529 522	529 507	529 507	2 647 636
GHG emission reductions, total	529 024	528 951	528 907	528 864	528 868	2 644 614

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	515	273	529 811	529 024
2009	565	295	529 811	528 951
2010	596	308	529 811	528 907
2011	628	320	529 811	528 864
2012	628	315	529 811	528 868
Total (t CO_2 e)	**2 931**	**1 511**	**2 649 056**	**2 644 614**

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 an Industrial Safety Appraisal and does not require an Environmental Impact Assessment. Nevertheless, EIA documentation was developed for the project.

On the basis of the undertaken Environmental Impact Assessment[7] the following conclusions were made:

1. Due to implementation of the waste utilization project the following pollutants are released into the atmosphere:
   - nitrogen dioxide;
   - nitrogen oxide;
   - hydrogen chlorine;
   - hydrogen fluoride.

2. The emissions from FOC thermal destruction amount to:
   - nitrogen dioxide - 0.1529 t/year;
   - nitrogen oxide - 0.0245 t/year;
   - hydrogen chlorine - 0.0242 t/year;
   - hydrogen fluoride - 0.0550 t/year

The total emissions of these pollutants from all sources are within the limit specified by the Company's permits for emissions.

3. The hazard class of the enterprise according to the methodology specified in "Recommendations for classification of enterprises into hazard categories depending on the amount and composition of pollutants emitted into the atmosphere" (developed by Goskomhydromet, published in Novosibirsk 1989) due to emissions of hydrogen chlorine and hydrogen fluoride has not changed and corresponds to the 3rd hazard class.

4. Dispersion modeling carried out using the standardized software "Ecolog" Version 3.0[8], taking into account background pollution, has shown that the concentration of the above mentioned pollutants at monitoring points on the boundary of the sanitary protection zone will not exceed the level of maximum permissible concentration.

5. The project generates liquid effluents and solid wastes. Waste water containing NaCl is produced after HCl formed due to the thermal decomposition of HCFC22 blow-offs has been neutralized in absorbers by contacting it with NaOH solution. Capacity of existing treatment facilities is sufficient to handle the effluents from the thermal destruction. NaCl containing waste water is than discharged into the Votkinskoye water storage basin of the Kama River in line with the water use license. The license allows the discharge of up to 7 833 thousand m^3/year of waste water, incl. 2 663 tons/yr of chlorides. Discharge of chlorides containing water from the project activity is 65.9 ton/yr that gives 576 tons/yr (21.6% of the permitted level).

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[7] "Environmental Impact Assessment due to implementation of utilization of gaseous emissions of HFC23 at JSC "Halogen", report conducted by JSC "BELZ", Perm city, 2007

[8] Software Ecolog 3.0 is a product of "Firm "Integral", Ltd. It is certified by Gosstandard RF, Cenrtification No.N POCC RU.СП04.H00063. The software is approved by a letter of Rospotrebnadzor No. 0100/6150-07-32 dated 18.06.2007 "On application of software package "Ecolog" for assessment of air pollution". http://www.integral.ru/program.php?action=proglist

6. As a result of the project activity solid waste (CaF) is formed. Thermal destruction of HCFC22 results in the generation of HF and HCl. HF is neutralized in the absorption tower, resulting in sodium fluoride formation, which in turn is delivered to the waste neutralization unit where it contacts with $Ca(OH)_2$ solution to generate calcium fluoride. The incremental quantity of calcium fluoride generated due to the project activity is handled at the existing waste treatment facilities that include a settling pond and sludge pit. The solid waste (sediment) quota is 2 000 tons/yr. Amount of solid waste generated as a result of the project activity is expected to be 257 tons/year. In 2007 the total amount of solid waste produced by the plant was 900 tons per year. Hence the waste processing system is capable of handling the forecasted increase in waste generation as a result of the project. If necessary however the solid waste quota can be raised.

Besides, Bashkiria Republican Scientific and Research Environmental Centre conducted a research[9] to identify the content of dioxins in the products of HFC23 and monomer-4 thermal hydrolysis when employing the technology proposed by the project.

The studies showed that under these conditions of co-combustion of destroyed components the content of dioxins in the waste gases from the unit is 14 pg/m^3 of dioxin toxicity equivalent (TEQ) that is much lower than EU standards for PCDD/F dioxins in emissions from incinerators (EU requirement for waste incinerators is 0.1 ng/m^3 [10]).

Thus, the emissions from the planned production facility do not require the boundary of the sanitary protection zone to be revised and will not lead to any significant negative impact upon the environment and do not aggravate the risks to public health from the emissions of JSC Halogen. Moreover, due to the project GHG emissions from JSC Halogen will be reduced significantly.

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.

[9] Report on scientific-research work “Analysis of dioxins content in exhaust gases after thermal destruction units for fluorine-chlorine containing wastes destruction at JSC “Halogen”, Ministry of natural resources of Bashkortostan Republic, “State institution Bashkiria Republican Scientific and Research Environmental Centre”, November 7th, 2007, Ufa city.

[10] Council Directive 94/67/EC of 16 December 1994 on the incineration of hazardous waste

SECTION G. Stakeholders' comments

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

The procedures accepted for JI projects in the Russian Federation do not require to obtain stakeholders' comments. Nonetheless, the project was presented to the local authorities and to the general public.

The information on the project was posted on the enterprise's official web-site in December 2007 at http://www.halogen.ru/main/news.php?menuid=21&newsid=104 .

Information on the project was additionally conveyed to the general public through an article published in the "Chimikh" newspaper. The article serves to raise awareness to the Kyoto Protocol, describes the purpose, scope and location of the project activity and provides information regarding the destruction efficiency of the process.

No enquiries from the general public were received as a result of these publications.

Furthermore, under the 20th provision of the federal law 'On environmental expertise' No.174-FZ, citizens and public organization and other stakeholders may request, as an initiative of their own that a public environmental expertise be carried out. Although not requests were received in this sense, the Federal Supervision Agency for Customer Rights Protection and Human Welfare (Rospotrebnadzor), issued a letter of approval for this project (Letter No. 02/13273 dated 20 Dec.2007).

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Annex 3

MONITORING PLAN

Annex 4

PROCEDURES FOR OPERATION, MAINTENANCE AND PERSONNEL TRAINING

Training of monitoring personnel

Control instrumentation and automation personnel (staff) operating the mass flow meters are trained in line with the existing approved training programme.

Personnel operating chromatographers are respectively trained and certified.

The company has its Training System in place according its internal standard STP-09-57-2005 "Training, Continuous Education and Personnel Development" to ensure all staff are adequately trained to perform their duties. An Annual Professional-Technical Training Instruction is issued every year and the persons in charge of overseeing and implementing it are appointed by the order of the General Director.

Training is conducted in accordance with approved programs and if required agreed with regulating authorities.

Personnel are additionally trained in dedicated training centres. The identification and coordination of training requirements is a responsibility of the Human Resources department and managers of company divisions.

Emergency preparedness for cases where emergencies can cause unintended Emissions

The technical guidelines and labour safety regulations applied to the relevant facilities contain the section «Emergency safety requirements». JSC Halogen is an experienced operator of such facilities, with management systems in place to establish the necessary procedures in the event of an intended release of gases.

Every hazardous production facility has its “Emergency response plan”. The plan includes procedures to be implemented in case of any emergencies at the facility. In particular it describes personnel’s actions to contain the accident and measures to minimize its consequences.

Unintended emissions released are addressed in compliance with existing regulations and plant procedures, and for the purpose of the JI project, their immediate and future impact on monitoring and data integrity is addressed through a combination of judicious design layout and data/results review.

For example, in the event of flame “loss” in a destruction furnace, the alarm on the control panel will activate and the supply of waste HFC23 to the incinerator “shuts down” automatically. Gas pressure will be relived through the venting system. The relevant pressure relief and shutoff devices in the waste supply line to the incinerator are located between the flow meters at the output of the rectifier column K-94 and the input of the incinerator. The difference between these readings is the volume of HFC23 waste discharged to atmosphere as a result of this event.

On-the-job accidents are investigated by a committee which is set up after an accident has taken place, in compliance with “Regulations on the accident investigation and reporting procedures in OJSC “Halogen” agreed with Rostekhnadzor.

Review of reported results/data

To measure the amount of destroyed HFC 23 accurately there are two flow meters installed working simultaneously. The flow meters are calibrated according to technical certificate of the equipment by an officially accredited entity.

Under normal operation both working flow meters measure the same amount of HFC 23 flow simultaneously. In case the flow meter readings differ by greater than twice their claimed accuracy then the reason for the discrepancy is investigated and the fault remedied.

Specialists of Camco International calculate GHG emission reductions based on data reported by the plant and prepare the Monitoring report after each reporting year. If accuracy of the source data is doubtful the data is checked and specified by specialists of JSC Halogen. Draft version of Monitoring report is sent to management of JSC Halogen for review. If mistakes are found specialists of Camco International correct the Report. Final version of the Report is submitted to the Russian Government for verification and approval.

Corrective actions in order to provide more accurate future monitoring and reporting.

Review of reported results and data is an ongoing process. Management systems in place ensure that any problems that have been identified are addressed in a timely manner. The effectiveness of measures adopted is monitored as part of this review process as part of a continuous improvement exercise.

To improve all stages of data collection and calculation of received GHG emissions and to prevent mistakes and inaccuracies, in-house training is held according JSC Halogen training plan.

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