National Survey and Development of a National Strategy Outline of HCFC Phase-Out for Consumption Sectors in Republic of Bulgaria

Yordan Lambrev National Consultant, Lambrev Consult Ltd

Kostadin Fikiin National Consultant, Technical University of Sofia

Richard J. Cooke UNDP Consultant, Man-West Environmental Group Ltd

Irina Sirashka Ministry of Environment and Water, Republic of Bulgaria

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Executive Summary

1. This study has been undertaken for the Ministry of Environment and Water of the Republic of Bulgaria (MOEW) as part of a regional Global Environmental Facility project with the United Nations Development Program acting as the implementing agency. The overall project's objective is to assist Countries with Economies in Transition (CEITs), to address HCFC phase out issues. Bulgaria, as a former CEIT and now EU member state, is participating in part to serve as a comparative example for other countries, as well as to undertake an evaluation of its own phase out status, both in terms of compliance with the Montreal Protocol (MP) and with more stringent EU control measures for HCFC phase out. The specific objectives of this work in Bulgaria are to evaluate the country's current state of compliance and to define the needs and barriers to successfully complete phasing out HCFC consumption in the context of EU and MP requirements. The principle product of the work is a set of recommendations to MEOW and the government generally on a strategies and actions for addressing these needs and barriers.

2. The work has been based on the collection of all relevant technical, commercial, policy, institutional, legal and regulatory information and data on the current status of HCFC use and trade (consumption, export/import) across any sectors where it is used. The primary source of information is derived from the licensing and user registration/reporting data base held by the MOEW plus stakeholder interviews and expert evaluations. It has been done primarily by national consultant experts supported by an UNDP international consultant.

3. Bulgaria has successfully moved from a traditional Article 2 Country with an Economy in Transition in terms of ODS phase out to one that is very well advanced in terms of meeting MP obligations as defined by the MP accelerated phase out requirements. In comparative terms globally, the country's consumption of HCFCs is at a level equivalent to 5% of its 1989 baseline, which is well within the 25% level required in 2010 and the 10% level in 2015. This makes it a leading Article 2 country in terms of MP compliance and will almost certainly to have fully phased out HCFCs before 2020.

4. There are no significant manufacturing sector issues associated with HCFC consumption in the country. The current estimated HCFC consumption (67 tons ODS in 2008) is exclusively used in the refrigeration servicing sector for the decreasing inventory of HCFC equipment. The current bank of refrigerant

inventory of identified equipment is 25% HCFC by volume which reflects a reasonably modern refrigeration sector. The country does not have to deal with the major issue facing most CEIT countries in the region, namely the large quantity of relatively new HCFC equipment that continues to grow, hence expanding instead of contracting HCFC demand. However, a substantial part of the remaining HCFC banks are in the small A/C sector, with refrigerant charges less than 3 kg, which are not subject to reporting regulations.

5. Bulgaria is currently nominally in compliance with the current EU control measures which impose a ban on any use of new or virgin HCFCs after January 1, 2010, including use for refrigeration servicing where a residual demand continues. It is allowed to use recycled HCFCs until 2015. The country has adequate infrastructure to supply these needs with recycled material and may acquire it from elsewhere within the EU. However, experience to date suggests that use of recycled material is very limited, with current demands potentially being met by material that is available illegally. A key challenge for the country is the implementation of measures that promote the use of recycled material and ensure a rapid removal from use of virgin material. This may be either sourced from banks accumulated prior to the ban or potentially illegally imported from the several neighbouring Article 5 countries where HCFCs remain and will continue to remain readily available (Macedonia, Turkey, Serbia).

6. A second key challenge for the country identified in this work is improving the level of compliance in the country with EU requirements for registration of equipment using “F” gasses generally which include HCFCs as well as their most common replacement HFCs. It was found that compliance with registration and reporting requirements which strictly control refrigerant usage, equipment maintenance practice and any disposition (emission, recovery, and disposal as waste) of refrigerants is estimated at less than 40%. Notwithstanding efforts by MOEW and its regional agencies to enforce these requirements, the level of control required within the EU is not being achieved, and greater awareness and enforcement is required.

7. The report elaborates on the importance of action in addressing these challenges not only in compliance terms but in avoiding negative social and economic impacts, particularly on the general population and small commercial enterprises, that could result from the absence of HCFCs for servicing, and arranging an orderly elimination of HCFC based equipment over the next five years. Similarly, the country needs to position itself proactively to deal with

future control measures likely to apply to F-gasses generally, due their high global warming potential, and to the need to capture and provide for environmental sound destruction of "end of life" ODS.

8. In conclusion, this work makes a number of specific recommendations on a strategy and action plan applicable to the period 2010-2015. These are:

- *Increasing Awareness:* The HCFC phase out appears to have a low profile generally and particularly with those most impacted, namely end users. This lack of awareness can be addressed by a focused campaign stating the implications of having to eliminate HCFC use and ultimately HCFC based equipment. The elements of this would be a range of information dissemination tools and involve partnership with industry associations, consumer organizations**,** and educational institutions. It would encompass such things as: i) best practices related to HCFC retrofits and replacement need to be made available to end users; ii) emphasis on the urgency of taking such action; iii) phase out case studies documented by end users and refrigeration service companies; iv) availability of refrigerant recycling and reclamation facilities in the country; and v) information on certification refrigeration service enterprises and technicians.
- *Strengthening Enforcement:* Implementing adequate enforcement policies and the necessary capacity to implement current regulatory requirements and curtail any continuation of illegal trade in HCFC is a key aspect of successfully completing phase out of HCFCs. Crucial roles are played by regional environmental inspectors and customs officers, who have to restrict the inflows of illegal imports and control the countrywide supply chain of recycled/reclaimed HCFCs and in enforcing equipment registration and record keeping requirements. This will require both a top down government policy commitment to apply the power and sanctions available as well as the financial commitment to resources needed to do it, in terms of organising training and purchasing detection equipment.

- *Information Management:* A key support tool for enhancing awareness and strengthening enforcement with respect to the current low level of registration and reporting applied to end user installations, as well as monitoring the availability and usage of recycled HCFCs would be improved information management, specifically though implementation of an integrated electronic information management system. This should start with a review of current reporting practices, such as reporting formats, traceability and the scope of reporting. It would cover installations containing ODS and fluorinated greenhouse gases generally. The system would help to standardise the data input and connect the the offices of regional environmental authorities with MOEW, and will facilitate the traceability of data and help to address the reporting requirements of the MOEW to the EC. Additionally it would also improve the communication with owners and operators, traceability and control of consumption and real-time reporting in changes of the status of installations (commissioning, charging, operation, servicing, de-commissioning)
- *Strengthening Refrigeration Servicing Training:* Building on the substantial capacity provided national educational institutions and Bulgarian Branch Chamber- Machine building for training certification and licensing of technicians and service companies, training of technicians should be expanded to increase the numbers of technicians certified beyond its relatively low level and for upgrading of already certified individuals.

- *Developing Enterprise Refrigerant Management / Replacement Plans and National Refrigerant Management Strategy:* It is recommended that specific requirements be introduced requiring all HCFC refrigerant end users to prepare a formal plan on how they will manage refrigerant through to its replacement over the next 5 years. At a national level it is also recommended that a national refrigerant management strategy be developed, which could support and guide the development of an enterprise specific plans. It might be supported by a national technical advisory capacity (designated institutes or individual technical experts along with resource material) that provide advice on retrofit and replacement options. This should be strongly oriented to low GWP alternatives as applicable, recognizing the global trends. It would also support more immediate priorities such as leak detection and the capture and containment of used/waste refrigerant for environmental sound disposal. Creation of a country-wide framework for collection and secure storage is also urgently required, including investigation of environmentally sound disposal of ODS in the country.

9. The report concludes with the recommendation that Bulgaria should approach the European Commission and potentially more senior members of the EU respecting assistance in undertaking the above recommendations, recognizing that allocation of national resources from both government and the private sector will also be required.

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List of Abbreviations

CEIT	Country with an Economy in Transition
CFC	Chlorofluorocarbons
EC	European Commission
EU	European Union
GEF	Global Environmental Facility
GWP	Global Warming Potential
HBFC	Hydrobromofluorocarbons
HCFC	Hydrochlorofluorocarbons
HVAC	Heating, Ventilation and Air-conditioning
MB	Methyl Bromide
MP	Montreal Protocol
MOEW	Ministry of Environment and Water
MT	Metric Tons
ODS	Ozone Depleting Substances
ODP	Ozone Depleting Potential
PU	Polyurethane
RAC	Refrigeration and Air-Conditioning
RIEW	Regional Inspectorate of Environment and Water
RMP	Refrigerant Management Plan
SME	Small- and medium-sized enterprise
TEAP	Technology and Economic Assessment Panel
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
VAT	Value added tax

1.0 Introduction

This study has been undertaken for the Ministry of Environment and Water of the Republic of Bulgaria (MOEW) as part of a regional Global Environment Facility (GEF) project[1] with the United Nations Development Program (UNDP) acting as the implementing agency. The overall project's objective is to assist Countries with Economies in Transition (CEITs) in addressing HCFC phase out issues. Its primary focus is non-Article 5 countries in the Former Soviet Union who are currently addressing new compliance requirements with Montreal Protocol 2007 Decision XIX/6 related to accelerated phase out of HCFCs. The inclusion of Bulgaria in the project occurred in recognition that, while now an EU member country, it potentially could benefit from analysis of the issue. Additionally, it was also felt that Bulgaria could serve as an example of how a country that is well advanced in the transition to a market economy and is now subject to the more stringent and advanced HCFC phase out obligations in the EU was addressing the issue and that these lessons would benefit the other countries involved in the project.

The work presented herein has been undertaken by local experts contracted by UNDP in association with MOEW and with inputs from an UNDP international consultant. It is intended to be used by MOEW in planning and implementing initiatives to increase the effectiveness of its current ODS management program, specifically in relation to ensuring the completion of HCFC phase out by 2015 as required under EU requirements.

[1] GEF MSP #2331 "Preparing for HCFC phase out in CEITs: needs, benefits and potential synergies with other MEAs" http://www.gefonline.org/projectDetailsSQL.cfm?projID=2331

1.1 Background

For more than fifty years, chlorofluorocarbons (CFCs) have been widely used as solvents, foam blowing agents, aerosols and specially refrigerants due to their preeminent properties such as stability, non-toxicity, non-flammability, good thermodynamic properties and so on. However, it has been proven that they have a harmful effect on the Earth's protective ozone layer, and as a result of this discovery, they have been being regulated internationally by the Montreal Protocol (MP) since 1989. Subsequently, it has also been found that emission of CFCs also contributed significantly to the global warming problem. As a consequence, extensive research has been done to find the suitable replacement for CFCs.

Initial alternatives included some hydrochlorofluorocarbons, or HCFCs, which are less harmful to the ozone layer, but still have significant ODP and as well as high GWP. As a result, the Parties to the MP adopted control measures under the Copenhagen Amendment in 1992 to phase them out and subsequently in 2007 to accelerate this phase out under Decision XIX/6[2]. While many HCFCs are in the list of controlled substances, only HCFC-22, HCFC -123, HCFC -124, HCFC -141b, HCFC -142b and HCFC -225ca/cb are consumed in significant quantities. Lists of HCFC substances controlled by the Montreal Protocol and blends containing HCFCs, including their ODP and GWP properties, are given in Annex III.

[2] Handbook of the Montreal Protocol, 8th Edition (2009), http://www.unep.ch/ozone/Publications/MP_Handbook/MP-Handbook-2009.pdf

Bulgaria started preparing for the ODS phase-out respecting Annex A and B in accordance with the requirements of the London Amendment in the early 1990's. In 1995 the GEF approved the Bulgarian ODS phase-out project and allocated 10.5 million USD to fund it. The project was successfully implemented by April 30, 2000[3]. Subsequently, Bulgaria was part of a regional methyl bromide phase out project financed by the GEF and administered by UNDP and UNEP.[4]

In preparation for EU membership and meeting the associated accelerated requirements for HCFC phase out, additional support from the Danish Government was provided in 2003 under which an initial HCFC strategy was developed (Bulgarian HCFC Phase out Strategy, 2003)

As a part of the EU accession process, Bulgaria has adopted the EU accelerated ODS phase-out schedule in 2002, and since Jan. 01, 2007, when Bulgaria has joined the EU, Regulations (EC) 2037/2000[5] and 842/2006[6], concerning the ODS and certain fluorinated greenhouse gases have been in force.

The EC Regulation concerning ODS is more ambitious even than the 2007 control measures under the Montreal Protocol with respect to phase-out schedules for HCFCs. It also has provisions on HCFC containing products and equipment, use of recovered, recycled and reclaimed HCFCs and linkages to control of F-gas emissions generally as a climate change mitigation measure. As a country formally considered as one with an economy in transition, this creates some particular challenges in meeting what are effectively the strictest control measures on HCFC and options for its replacement. Globally, HCFCs are used in a number of industry sectors, including refrigeration and air conditioning (AC), fire extinguishing, foams,

[3] "Implementation Completion Report on GEF Bulgaria Ozone Depleting Substance Phase Out Project, World Bank Report No. 20679, June 2000, " http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2000/09/15/000094946_00090205325563/Rendered/PDF/multi_page.pdf

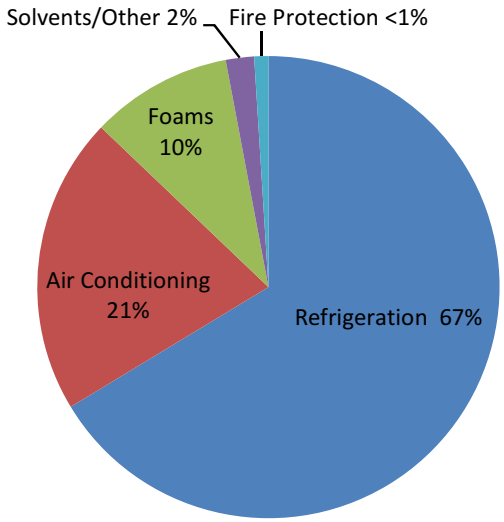
[4] GEF FSP #1305, "Initiating Early Phase Out of Methyl Bromide Through Awareness Raising, Policy Development and Demonstration/Training Activities, http://www.gefonline.org/projectDetailsSQL.cfm?projID=1305

[5] Regulation (EC) 2037/2000 of the European Parliament and Council of 29 June 2000 on substances that deplete the ozone layer

[6] Regulation (EC) 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases

and solvents. However, the majority of HCFC consumption occurs in the refrigeration and air conditioning (RAC) with about 88 percent of the usage. Foam applications account for about 10 percent, as shown in Figure 1 (HCFC Task Force 2007).

Figure 1. HCFC Consumption by Sector (ODP-weighted; HCFC Task Force 2007)



The primary HCFCs in use in these sectors, as well as the other sectors, are shown in Table 1.

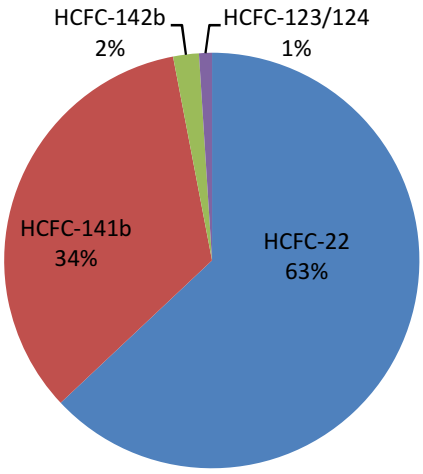
Table 1. Common HCFCs, their ODPs, and Global Sectors of Use

Substance	ODP	Sector			
		Refrigeration and Air Conditioning	Fire Extinguishing	Foams	Solvents
HCFC-22	0,055	X		X	
HCFC-123	0,02	X	X		
HCFC-124	0,022	X			
HCFC-141b	0,11			X	X
HCFC-142b	0,065	X		X	

HCFC-22 and HCFC-141b are the primary HCFCs used in the RAC and foams sectors and as such, represent the majority (97 percent) of HCFCs used; the percentage of each HCFC as a portion of total consumption is presented in Figure 2 (HCFC Task Force 2007). While HCFC-22 is the principal HCFC by volume, it should be noted the ODP of HCFC-141b is twice that of HCFC-22, making the two chemicals almost equivalent in terms of net emission impact. Conversely, HCFC-22

has a substantially higher GWP making its climate impact the greatest by a significant margin.

Figure 2. HCFC Consumption by Substance (ODP-weighted; HCFC Task Force 2007)



For the last decade HCFC-22 and blends mainly based on HCFC-22 have been the primary refrigerants used in the refrigeration and air-conditioning sectors. A number of HCFC blends have also been used as drop-in substitutes for old CFC-12 designed equipment after the CFC phase out. HCFC blends which have been used in various applications such as stand-alone retail equipment, vending machines, large supermarket systems, cold storage and refrigerated transport as well as in heat pumps, unitary and other air conditioning equipment include R-401A, R-401B, R-402A, R-402B, R-408A, R-409A[7].

The foam sector applications include HCFC-141b, HCFC-142b and HCFC-22, and main uses are domestic refrigeration, appliances, panels, spray, pipe insulation and block foams.

[7] TEAP RTOC Assessment, 2006, http://ozone.unep.org/Assessment_Panels/TEAP/Reports/RTOC/rtoc_assessment_report06.pdf

Table 2: GWPs of HCFCs and alternatives

	IPCC Second Assessment Report (SAR) (IPCC 1996)	IPCC Fourth Assessment Report (AR4) (IPCC 2007)
HCFC-22	1500	1810
HCFC-123	90	77
HCFC-141b	600	725
HCFC-142b	1800	2310
HFC-125	2800	3500
HFC-134a	1300	1430
HFC-245fa	NA	1030
HFC-365mfc	860	794
HFC-404A	3280	3922
HFC-407C	1526	1744
HFC-410A	1725	2088
HFC-507C	3300	3986
HFO 1234-yf		<150*
CO2	1	1
Ammonia	<1	<1
Propane	NA	3,3
Butane	NA	4
Pentane	<25 (Source: FTOC2006)	
c-Pentane	<25 (Source: FTOC2006)	

There is a variety of HCFC alternatives that can be used in retrofitting of old equipment and in new equipment in refrigeration and air conditioning. Technologies using HFCs, hydrocarbons and carbon dioxide have been commercially available for many years and most recently alternative involving methyl formate and HFOs have been introduced. When using hydrocarbons, the main concerns are the safety issues which restrict their applications in larger systems in most parts of the world.

A range of alternatives for HCFCs has been developed for the refrigeration, air-conditioning and foam sectors- HFCs, natural refrigerants (hydrocarbons, ammonia and carbon dioxide). HFCs do have significant global warming potentials (GWP) and it is important to consider the climate impact when selecting alternatives. Table 2 lists the GWPs of the most common HCFCs and their alternatives- HFCs, HFO and natural refrigerants.

1.2 Study Approach and Methodology

The overall approach in this work was to seek an updated data base on the usage of HCFCs in the country through analysis of existing information held by MOEW and follow this up with direct contact through a survey with various stakeholders.

As a starting point for the survey, the data available at the MOEW for 2007 and 2008 has been summarised and analysed. This covered reported data on imports (including inter-community deliveries) and exports, and registration data on holders of HCFC (and F-gasses generally) in operational equipment as required under EU regulations in effect in Bulgaria. With respect to the latter, since 2006, reporting of the quantity of banked refrigerant (for organisations or individuals owning or operating equipment containing more than 3 kg. fluorinated greenhouse gases) became mandatory, and the first sets of data available in the MOEW are for 2007.

In accordance with Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer (in force since 2007), Clean Air Act (last amended in 2008) and the Ordinance for the control and management of substances that deplete the ozone layer (last amended in 2008):

- Importers/exporters of ODS report directly to the EC with a copy to MOEW.
- Users report annual information to the RIEW[8] including: quantities purchased (virgin, recycled, reclaimed), used, stored.
- Processing undertakings annual information to RIEW on processed quantities of ODS (recycled, reclaimed), source of ODS, stored ODS
- RIEW summarize the information and send it to MOEW.
- Customs agency provides information on imported/exported ODS as well as on proved cases of illegal trade.

Based on this information and on industry interviews and expert advice, the critical user groups and individual users have been identified.

The survey methodology included analysis of the 2003 HCFC Phase-Out Strategy, current legislation in the area of HCFCs and F-gases, and thorough study, systematization and analysis of data provided by the regional offices of the MOEW, as well as discussions and interviews with experts in the field. As the primary data appeared to be insufficient and not comprehensive, secondary research, additional

[8] Regional Inspectorate of Environment and Water under MOEW

interviews and company visits has been carried out to improve the reliability of the research and the relevance of the actions to be recommended.

Secondary research has been carried out using various sources of information such as company references and web-sites, industry associations and representatives of regional inspectorates of the MOEW of Republic of Bulgaria. As a result, a number of potential users of HCFCs which have not provided data to the regional inspectorates of the MOEW had been identified, and company visits were organized to check and discuss the present situation and the anticipated future plans and actions for the phase-out of HCFCs in correspondence with the country obligations.

In summary, the following lists the sources of information used in the work:

- Data provided by the Ministry of Environment and Water of Republic of Bulgaria;
- Data from Industry associations;
- Interviews with representatives of the regional inspectorates of the MoEW, suppliers and wholesalers of HCFC and HFC products and equipment;
- Surveys of major users of refrigeration, air-conditioning and Foaming installations;
- On-site visits of major users

2.0 Survey Results

2.1 Institutional and Regulatory Framework

The overall legal basis for ODS phase out generally and specifically HCFC Phase out in Bulgaria are the international obligations assumed firstly as a Party to the MP and most recently as a member of the EU. Bulgaria has ratified the Vienna Convention and the Montreal Protocol in 1989. The London and Copenhagen amendments were ratified in 1998, the Montreal amendments- in 1999, and the

Beijing amendments- in 2002. The country has completely phased out CFCs, halons (except some critical applications), tetrachlormethane and methyl chloroform (except in laboratory and analytical applications), hydrobromofluorocarbons (HBFCs) and methyl bromide (MB).

The following outlines the phase out schedules dictated by these obligations which in the case of the MP are the accelerated phase out schedule under the 2007 Decision XIX/6 as illustrated in Table 3 below for non-Article 5 countries.

Table 3. Accelerated MP HCFC phase-out schedules (consumption)

Countries operating under Article 2	Regulation (EC) No 2037/2000
reference (baseline) level: average of year 1989: 2.8% of CFCs + 100% of HCFCs consumed freeze from January 1, 1996 minus 35% by January 1, 2004 minus 75% by January 1, 2010 minus 90% by January 1, 2015 **phase-out by January 1, 2020**	

The MP HCFC phase-out schedule is based on consumption in 1989 which constitutes the baseline against which reductions are measured. Bulgaria imports all ODS used in the country, and in this case

Consumption = Imports – Exports.

The baseline HCFC figure is calculated (in ODP tons) as follows:

Baseline HCFC = HCFC consumption (1989) + 2.8% of CFC consumption (1989)

Bulgaria consumed in 1989 8.6 ODP tones HCFCs and 2611.8 ODP tones CFCs, giving a 1996 baseline HCFC consumption of 81.8 ODP tones.

The updated phase-out schedule for Bulgaria based on Decision XIX/6 is:

Table 6. MP HCFCs phase-out schedule for Bulgaria

Year	Baseline	Reduction	Allowed quantity (ODP)
1996	1989	0 %	81.8
2004	1989	35 %	53.2
2010	1989	75%	20.5
2015	1989	90 %	8.2
2020	1989	99.5 %	0.4
2030	1989	100 %	-

The 2001 baseline is calculated as:

2001 Baseline HCFC= HCFC consumption (1989) + 2.0% of CFC consumption (1989)

Bulgaria consumed in 1989 8.6 ODP tones HCFCs and 2611.8 ODP tones CFCs, giving a 2001 baseline HCFC consumption of 60.8 ODP tones.

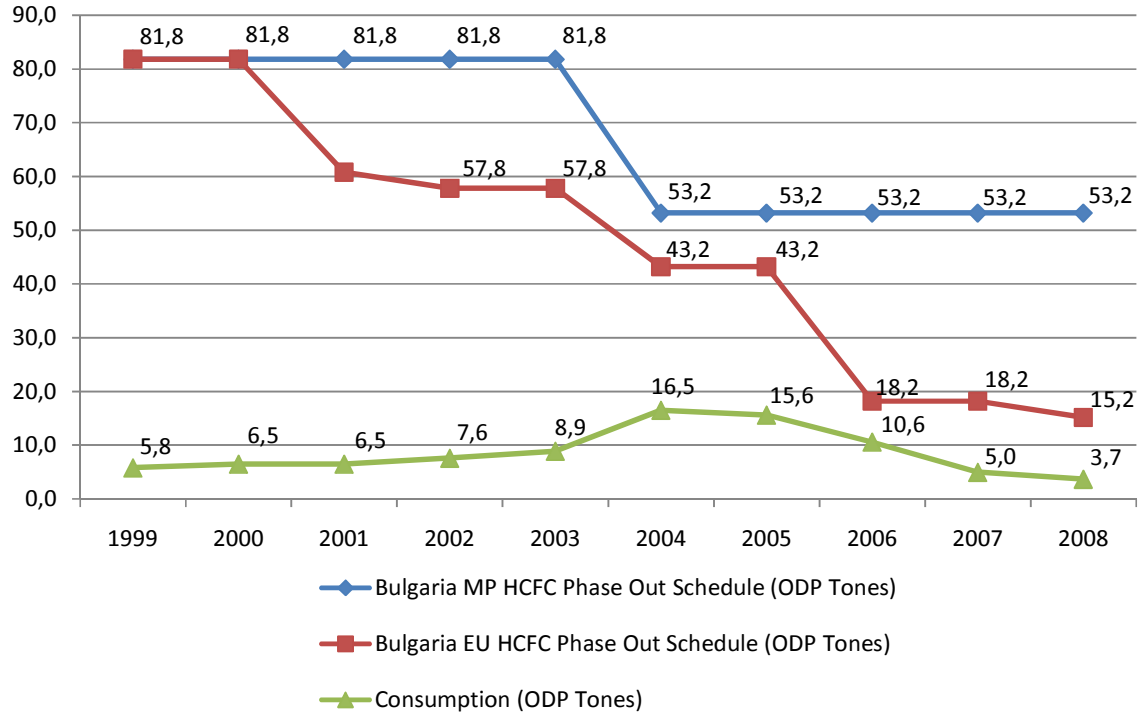
Due to the country's EU accession (effective from 01 Jan. 2007) and the preceding negotiations, Bulgaria has adopted (in force from 01 Jan. 2006) an ***accelerated HCFC phase-out schedule*** (Decree 254/99) that corresponds to the EU phase-out schedule:

Table 7. Bulgarian EU HCFC phase-out schedule

Year	Baseline	Reduction	Allowed quantity (ODP)
1996	1989	0%	81.8
2001	2001	0%	60.8
2002	2001	5%	57.8
2004	2001	29%	43.2
2006	2001	70 %	18.2
2008	2001	75 %	15.2
2010	2001	100 %	-

Figure 3 shows the MP and EU phase-out schedules compared to the actual consumption of Bulgaria:

Figure 3. Bulgaria's compliance with the MP and EU HCFC Phase out Schedule (ODP Tones)



2.2 Policies and Regulations

Achievement of this phase-out schedule is based on the adoption and implementation of Regulation (EC) No 2037/2000 on ozone depleting substances[9] which controls the production, importation, exportation, placing on the market, use, recovery, recycling, reclamation and destruction of all ODS and Commission Decision 2005/134/EC which determines the mechanism for the allocation of quotas to producers and importers of HCFCs from 2003 to 2009.

Regulation (EC) No 2037/2000 replaced Regulation (EC) No 3093/94 concerning the ODS, in order to adapt the regulations of the EU to the technical

[9] As the EC Legislation concerning the HCFCs is in the form of a Regulation and not a Directive, it is directly applicable in each member country law. In this sense, Bulgarian HCFC legislation completely coincides with the EU regulations.

development and to the amendments of the MP for ODSs. By tightening the restrictions compared to Regulation (EC) No 3093/94, Regulation (EC) No 2037/2000 addressed the increased number of options for substitution of ODS.

After a review of Regulation (EC) No 2037/2000, which has started at the end of 2006, the European Commission presented a proposal on 1 August 2008 which recast and amended the current legislation, with main objectives- ***simplification of the legislation in force*** and ***reduction of unnecessary administrative burdens***. It has also ensured the continued compliance of Member States with the MP, as adjusted in 2007 under Decision XIX19/6.

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, which recasts and amends Regulation (EC) No 2037/2000, has been published in the Official Journal of the EU on Oct. 31, 2009, and comes into force on 1 January 2010. The regulation removes obsolete provisions and procedures, e.g. on essential and critical uses of ODSs and streamlines certain reporting obligations. As in the case of Regulation (EC) No 2037/2000, Regulation (EC) No. 1005/2009 will have legal force in Bulgaria.

The production phase-out of hydrochlorofluorocarbons has been brought forward from 2025 to 2020 in line with the recent decision under the Montreal Protocol. Combined Nomenclature codes have been laid down, which provides detailed information for the content of the imported/exported substance. Different codes have been created for the different groups of pure substances and mixtures. It also introduces amendments to the current legislation to facilitate enforcing and preventing the illegal trade and use of ODSs and products and equipment containing or relying on those substances in the EU and tightens current provisions on the recovery and destruction of ODSs contained in products and equipment- ODS banks.

Regulation (EC) No 1005/2009 also addresses the rules related to the use of recycled HCFCs from Jan. 01, 2010, until 31 December 2014. ***Recycled*** HCFCs may be used for the maintenance or servicing of existing equipment provided that they have been recovered from such equipment and ***may only be used by the***

undertaking which carried out the recovery as part of maintenance or servicing or for which the recovery as part of maintenance or servicing was carried out. Recycled HCFCs may not be placed on the market, which means that they cannot be supplied or made available to third persons within the Community, ***either for payment or free of charge***. For example, the owner could use the recycled HCFC in RAC equipment at other sites they operate from but they ***cannot sell recycled HCFC to a third party***. It is important to note that it is obligatory that companies using recycled or reclaimed HCFCs for service or maintenance must keep records of the suppliers of the reclaimed gases and the sources of the recycled gases they have used. According to the EC, the operator of refrigeration equipment can use recovered HCFCs for its own installations, also if they are not located on the same site, but that also the servicing company is entitled to collect recovered material to use it for equipment of another client. Only the handing over to another servicing company or to another third party not in the context of maintenance or servicing would be excluded.

All ODS used in refrigeration and air conditioning equipment must be recovered during servicing and maintenance of equipment or prior to dismantling or disposal of equipment. Recovered HCFCs can either be destroyed or can be re-used until 2015. Waste ODS must be disposed of in a manner which does not harm human health or damage the environment. It is possible that some waste ODS may be "special waste" and so subject to more stringent disposal arrangements than most other wastes. Special rules also apply to their import and export.

2.3 Institutional Capacity

In terms of institutional arrangements for implementation of ODS phase out in Bulgaria, the MOEW and its sixteen RIEW are the institutions responsible for the implementation and enforcement of the country policy in environmental protection and HCFC phase-out. The regional inspectorates (RIEW) have the obligation to:

- Control and verify the data reported by operators and owners concerning the installed equipment;
- Check the proper execution and reporting of the leak tests and system

repairs;

- Verify the proper training and certification of technical staff doing servicing and repair of ODS and F-gases containing equipment;
- Control the certification of companies servicing installations containing fluorinated greenhouse gases and ODS.

The RIEW are equipped with staff with appropriate education to perform the tasks, but ongoing training is necessary to keep them in pace with the changes in the regulative framework and industry standards.

Other important stakeholders with strong influence on trade with ODS are the ***customs officers,*** under the authority of the National Customs Agency of Republic of Bulgaria. Being an EU border country, Bulgaria could easily be used as an entry point of illegal HCFC into the European market. The risk for illegal import is especially high concerning the borders with Turkey and Macedonia, both classified as Article 5 countries by the MP.

Most ODS, including HCFCs, are odourless gases or liquids that boil at low temperatures. But these characteristics do not help customs officers identify illegal ODS, as ozone-friendly substitutes, such as HFCs, are also gases without scent and or low boiling compounds. Furthermore, the chemical names of ODS and their non-ODS counterparts may look very similar to an official checking documentation, and to make matters worse, these substances are often imported or exported under trade names only.

Combined Nomenclature codes have been laid down in Annex IV of Regulation (EC) No 1005/2009, which provide detailed information for the content of the imported/exported substance. Different codes have been created for the different groups of pure substances and mixtures. Moreover, in accordance with Regulation (EC) No 1005/2009 the European Commission has prepared a list of CN codes of goods that are ODS or that may contain or rely on ODS and therefore would fall under Regulation (EC) 1005/2009. The document aims to assist customs authorities in identifying such goods.

Until 31 December 2014, reclaimed hydrochlorofluorocarbons may be placed on the market and used for the maintenance or servicing of existing equipment, provided that the container ***is labelled with an indication that the substance has been reclaimed and with information on the batch number and name and address of the reclamation facility***. When reclaimed or recycled hydrochlorofluorocarbons are used for maintenance or servicing, the ***equipment concerned shall be labelled*** with an indication of the type of substance, its quantity contained in the equipment and the label elements set out in Annex I to Regulation (EC) No 1272/2008 for substances or mixtures classified as Hazardous to the Ozone Layer.

Concerning the largest application of HCFCs- as refrigerants in RAC installations, measures have been taken to implement the EU Directives. In the design process, only qualified members of the Chamber of Engineers in Investment Design have the right to design Refrigeration and HVAC installations, and this is controlled in the subsequent approval process from local authorities issuing construction permits. On the execution stage, independent companies, which exert control on the construction of new plants or buildings, are obliged to control the implementation of the ***building codes and standards*** and the conformity of materials and equipment with the EU directives and regulations, and request from suppliers a "Declaration for Conformity" for each piece of material or equipment to be installed. This makes the legal installation of new HCFC-containing equipment impossible either in the design or execution phase.

2.4 Technical and Scientific Capacity

The country is generally well-resourced with technical and scientific capacity to support ODS related activities such as technical training and the introduction of alternatives. There are several universities (Technical University- Sofia, University of Food Technology- Plovdiv, and Technical University- Varna) and more than ten technical schools which train engineers and technicians in refrigeration and air-conditioning.

University graduates can become members of the Chamber of Engineers in Investment Design after gaining three years of professional experience. Designs and projects are approved by the local authorities only if they are designed by members of the Chamber of Engineers, which is certified by the designer's certificate and personal seal. The section "HVAC and Refrigeration" of the Bulgarian Chamber of Engineers has had 890 members in 2009. Practically these are the people which design all middle- and large scale refrigeration and HVAC installations in the country. The Chamber of Engineers organizes regular courses and information dissemination to keep its members informed of the latest changes in the national and European regulations, technical achievements and good practices.

As a next step of the design process, projects are submitted for approval by the local authorities responsible for issuing construction permits. After the approval, the actual execution of the project is controlled by independent consulting companies, which are responsible for the conformity between design and execution and for the control of the declarations of conformity of the equipment with the European Directives. In this sense, they are the ones that control what kind of equipment is installed on site and the qualification and licenses of the installation companies.

Bulgarian Branch Chamber- Machine Building is the organisation issuing certificates to individuals and companies for maintaining refrigerant installations and in accordance with Regulation (EC) No 842/2006 and Regulation (EC) No 2037/2000.

There are five training centres prepared to organise technician training in accordance with Regulation (EC) No 303/2008. They have proved that their training programs cover the minimum requirements set out in Annexes to the Regulation (EC) No 303/2008, as well as that they have the necessary material base to organise practical trainings.

2.5 HCFC Consumption in Bulgaria

Bulgaria has a ***licensing system*** for the imports of HCFCs from non- EU member states. Every company wishing to import HCFCs should apply for an

import quota to the EC for the following year. Importers have to apply for an import license to the EC, with a copy to the MOEW, and specify the quantity of ODS, the countries involved in the transaction, what the chemical will be used for, etc.

Since 2007, no Bulgarian company has applied for an import license, and there is no non-EU origin HCFC supply in the country.

It is important to note that purchasing goods and services from EU suppliers has not been treated as an import but as an ***intra-community delivery***, and companies do not have to apply for a quota in this case. Bulgarian Customs Agency reports to the MOEW once a year (in March) for quantities imported and exported for the preceding year. No Bulgarian company has applied for an import quota in 2008/2009.

Bulgarian wholesalers purchase refrigerants exclusively from other EU states. They are obliged to declare these intra-community deliveries to the MOEW of Bulgaria under the *Ordinance for the control and management of substances that deplete the ozone layer*. Reporting is done once a year, at end of February, for the preceding year. The major suppliers of HCFC-22 to users in Bulgaria are Helpman-Bulgaria, Institute of Refrigeration, Prista Chim, Nordtechnik, Frigosoos, SIAD, Frigocommerce.

There is no production of HCFCs in Bulgaria. Export is limited to ship supply/ servicing marine refrigeration installations. There is no other reported export of HCFC or HCFC containing equipment from the country.

Table 8. Reported export of HCFCs and HFCs in 2008

	R-22	***R-134a***
Export, [ODS kg]	2 788,6	1 610,0

"Consumption" is defined as the amount of controlled substances produced, minus the amount destroyed by technologies approved by the Parties and minus the amount entirely used as feedstock in the manufacture of other chemicals. The amount recycled and reused is not to be considered as "production".

Consumption = (Production + Imports) – Exports.

In the case of Bulgaria, Production=0 and:

Consumption = Imports – Exports.

It is important to distinguish the term "import" from country point of view and from EU point of view. Import in Bulgaria in the last years comes only from other EU countries, and, viewed from EU perspective; it is not an import but an intra-community delivery. (Before the Bulgaria's accession to the EU, as "import" was considered every delivery outside the country, including from the EU Member States. Since Jan 1, 2007 all goods purchased from other EU Member States have not been treated as an import but as an intra-community delivery).

The net consumption of HCFCs in Bulgaria (including intra-community deliveries) in the period 1999-2008 is given in Table 9.

Table 9: Net Consumption of HCFCs in Bulgaria (ODS kg.)

	1999	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
HCFC-22	102700	116200	76400	79260	115320	209944	179226	192113	90424	67170,4
HCFC-124	5860	2900	30	740	430	284	0	0	34	0
HCFC-141b	6000	2400	16800	32105	19880	0	0	0	0	0
HCFC-142b	430	0	0	0	230	76468	88271	881	20	0

* Small quantities of HCFC-124 and HCFC-142b have been imported in HCFC based blends

Until 2007, Bulgaria has regularly provided information on ODS consumption to the Ozone Secretariat. From the beginning of 2007, as an EU member, reporting is done by the EC ***collectively for all EU member states***.

Table 10: Net Consumption of HCFCs in Bulgaria (in ODP tones; Recorded by Ozone Secretariat + calculated for 2007 and 2008)

	1999	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
ODP tones	5.8	6.5	6.5	7.6	8.9	16.5	15.6	10.6	5.0*	3.7*

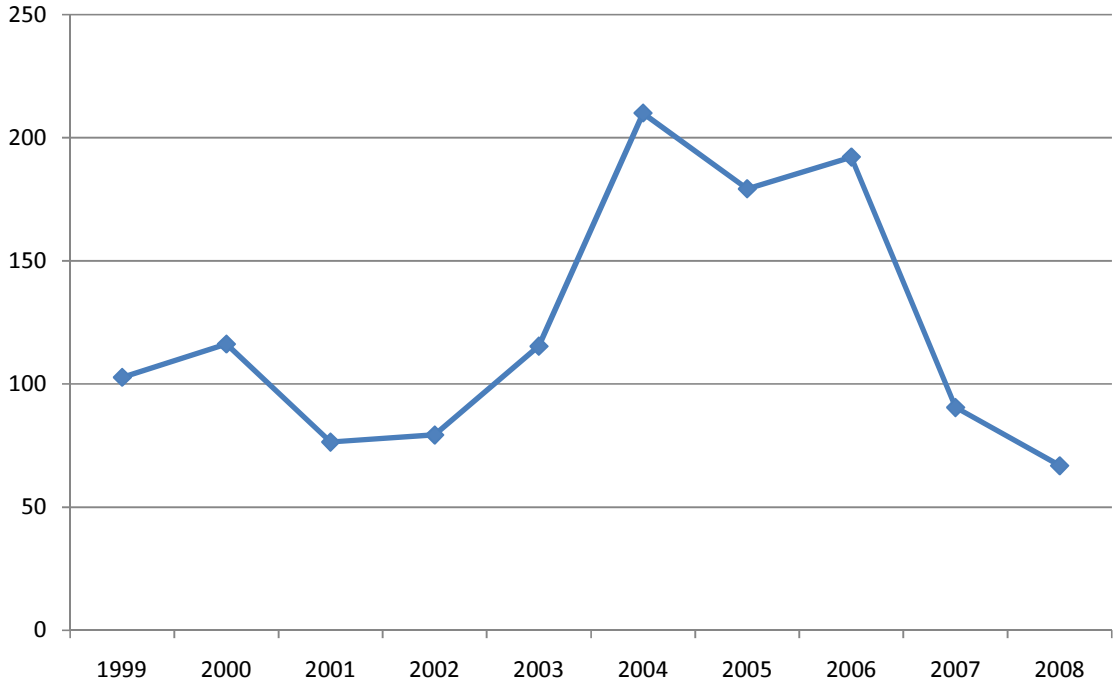
* Data based on data on intra-community deliveries from other EU member states

The main HCFC products historically used in Bulgaria is HCFC-22. HCFC-141b and HCFC-142b have been used as blowing agents in the production of polyurethane and extruded polystyrene foams. HCFC-124 is an HCFC retrofit

refrigerant for CFC-114 in certain applications, such as centrifugal chillers. It is also used in high ambient temperature cooling applications such as overhead cranes.

The net consumption of HCFCs in the country has declined steadily in the last years, with the last remaining HCFC product with substantial consumption being HCFCR-22. This would appear to be exclusively for use in refrigeration servicing. The trend continues in 2008, with net consumption of HCFC-22 being 26% lower than in 2007.

Figure 4. Net Consumption of HCFC-22 in Bulgaria, 1999-2008 (ODS tones)



More information on consumption of pure HCFC or HCFC-containing mixtures in Bulgaria in 2007 and 2008 is given in Table 11.

Table 11: Consumption of HCFCs in Bulgaria, 2007-2008

	2007	2008	2007	2008	2007	2008	2007	2008
	HCFC-22		MP-66		HP 80 (HCFC402A)		HCFC-409A	
			HCFC-22/HFC-152a/HCFC-124		HFC-125/ HCFC-22/ R-290		HCFC-22/HCFC-124/HCFC-142b	
			61/11/28		60/38/2		60/25/15	
Qantity of HCFC, *[kg]*	**80 561,0**	**69 624,4**	**0,0**	**60,0**	**1 100,0**	**880,0**	**136,0**	**0,0**

From the information provided in Table 12 we can draw the conclusion that HCFCs are less than 30% of the total refrigerant demand in Bulgaria. The quantity of HCFC-22 (66.8 MT) is used for servicing existing equipment, and has to be covered by recycled/reclaimed refrigerant from 2010 onwards. While nominally this represents a best current estimate for the current demand for HCFCs it is also likely conservative given additional decline in demand in 2009 and also the potential for some reported imports to have been banked for use illegally in servicing HCFC-22 installations after the ban of use virgin HCFC in the country from Jan 01, 2010.

Table 12: Consumption of HCFC and HFC Refrigerants in Bulgaria in kg, 2008

	HCFC			HFC									
	R-22	R-402a	R-406A	R-134a	R-404A	R-407A	R-407C	R-410A	R-422D	R-413A	R-152A	R-507A	R-507C
Import, *[kg]*	69 624,4	880,0	0,0	79 458,9	56 166,4	0,0	12 109,4	15 489,5	3 420,0	680,0	31,0	1 458,0	0,0
Export, [*kg]*	2 788,6	0,0	0,0	1 610,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Net Consumption, *[kg]*	**66 835,8**	**880,0**	**0,0**	**77 848,9**	**56 166,4**	**0,0**	**12 109,4**	**15 489,5**	**3 420,0**	**680,0**	**31,0**	**1 458,0**	**0,0**

Based on the above, 2008 HCFC consumption in Bulgaria was approximately 3.74 ODP which is 4.6% of its 1989 MP base line. Its MP phase out schedule requirement for 2010 and 2015 respectively are 25% and 10% so under the MP the country is substantively in compliance and well advanced in terms of the overall MP phase out objectives for non-Article 5 countries. However, the country does have challenges respecting compliance with the EU phase out schedule. As discussed in the next section, this is largely associated with the supply of recycled

HCFC-22 to meet the residual servicing demand that will persist between 2010 and 2015.

2.6 Recycling/ Recovery/ Reclaim

The legal limitation on only using recycled HCFCs after the end of 2009 posses a significant issue. No company was offering reclaimed HCFC-22 in December 2009, only 4 weeks before the ban of use of virgin HCFCs. The only opportunity to get reclaimed material is to provide recovered material to the reclamation facility and to pay for the service. This process would inevitably lead to business interruptions of the refrigerant equipment users which still run HCFC-charged installations, or they will have to perform urgent retrofits with drop-in substitutes.

It is important to note that use of recycled HCFCs is riskier than use of reclaimed HCFCs due to reclaimed material being reprocessed to a specified quality suitable for use in RAC systems, whereas recycled material might contain contaminants that could impair the performance of a refrigeration plant. As a general rule it is worth spending a bit more to get recovered refrigerant properly reprocessed into reclaimed fluid (F-Gas Support Information Sheet RAC 8 –R-22 Phase-out: The EC Ozone Regulation Legislative Update and Strategies for HCFC Phase-out)

Table 13. Definitions: Recovered, recycled or reclaimed ODS[10]

Recovery	the collection and the storage of controlled substances from products and equipment or containers during maintenance or servicing or before disposal;
Recycling	Re-use of a recovered ozone-depleting substance following a basic cleaning process (such as filtering and drying; for refrigerants, recycling normally involves recharge back into equipment; it often occurs on-site)
Reclamation	reprocessing of a recovered controlled substance in order to meet the equivalent performance of a virgin substance, taking into account its intendeduse (through mechanisms such as filtering, drying, distillation and chemical treatment in order to restore the substance to a specified standard of performance. Often involves processing off-site at a central facility)

[10] REGULATION (EC) No 1005/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 September 2009 on substances that deplete the ozone layer

The reported quantity of HCFCs reclaimed in Bulgaria in 2008 is less than 2000 kg.(1500 kg. reclaimed and 500 kg. recycled material) and only two operators have provided data for the reclaimed/recycled quantities, the largest being the Institute of Refrigeration in Sofia with 1500 kg of reclaimed material.

There are two reclamation facilities in the country- one in Sofia (Institute of Refrigeration), and one in Varna (Cool Star Ltd.), and 30 recycling units. Both of the reclamation facilities have capacity of 80 kg. refrigerant per shift, which results in annual capacity of 36.8 tones in single shift and 73.6 tones in two-shift operation, which is enough to cover the country's forecasted demand.

The country is relatively well equipped with reclamation capacity compared to most of the other EU member states, but the amount of reclaimed refrigerant is low (see Table 14), and only the Institute of Refrigeration has performed refrigerant reclamation in the last seven years.

Table 14. HCFC-22 collected for Reclamation in Bulgaria (Non- ODP weighted)

	2003	2004	2005	2006	2007	2008	2009 *(est.)*
Quantity, [kg]	100	150	200	250	350	1500	1800

Even though the country has favourable reclaim infrastructure with two facilities (one of them located in the west of the country and one in the east, with greatest distance from service to facility less than 250 km), reclamation continues to be low due to a number of reasons such as cost and lack of awareness.

The total cost for reclaimed refrigerant (= reclamation+ costs for logistics and handling) at the last quarter of 2009 were comparable to the cost of virgin material.

The anticipated increase in price of recycled and reclaimed refrigerant after 01 Jan. 2010 and the fact that it will be the only alternative to continue operating not retrofitted facilities will contribute to the increase of the attractiveness of reclamation. In addition to the likely improvement in the economic viability of recovered/recycled and reclaimed refrigerant, increasing awareness and regulatory enforcement will be required to promote its utilization. This will include increasing

the awareness of technicians and installation owners and operators to the responsible handling of HCFCs and making stakeholders aware of the location of recycling and reclamation facilities. Similarly, strict control and legislation enforcement should be in place, in order to assure compliance with the regulations concerning maintenance, recovery, recycling/ reclamation and disposal of HCFC and HFC refrigerants. Although awareness levels of the legislation are high, the relative low level of registration of banks of HCFCs noted above suggests that this has not been coupled with a sense of urgency to ensure compliance.

Hundreds of HVAC installations will need to be serviced regularly in order to ensure compliance by 2010. For companies that are reliant on refrigeration, ***delayed action – or inaction - can pose a threat to business.*** The large number of remaining HCFC banks means that as more and more businesses begin to react to the legislative imperatives in the run-up to 2010, there will be a significant strain on contractor services. Furthermore, manufacturers are expected to scale down their production of HCFCs from mid-2009. These twin factors threaten to create a bottleneck, incurring costs for businesses that delay their response.

A number of HCFC users intend to wait for the ban on recycled HCFCs to be introduced in 2015, in the belief that there will be a sufficient supply of reclaimed HCFC-22. However, given the high cost of the recycling or reclamation process, current projections place the availability of recycled or reclaimed HCFC-22 at ***only 15% of the amount needed to service remaining installations using HCFCs in the EU*** [11].

There are many companies engaged in end-of-life disposal of RAC equipment but is just one company oriented to the collection of HCFCs and subsequent transportation for destruction- Balbok Engineering. Their license has been granted a few months ago, and their collection site will be in operation from March 2010.

[11] "8 years after introduction of legislation, and with only 17 months left before ban, study shows 65 percent of cooling installations* still use HCFC gases" DuPont News Release FLCH-EU-2008-09, Oct. 2008

There are no refrigerant destruction installations in the country. The company will collect and export the refrigerants for destruction to other EU Member states (Western Europe presumably, as importing hazardous waste for destruction is prohibited in Romania, which hosts the incinerator nearest to Bulgaria), and the transportation costs will added to the destruction costs. Precise calculations of destruction costs are still not available, but presumably they will be in the range of 3 to 5 EUR/kg. Additional 1-1.5 EUR/kg will be the cost of transportation to the destruction facility, which will result in costs between 4 and 6.5 EUR/kg for users, which from the perspective of the business will be considered very costly.

In the future, monitoring of the use and amounts of HCFC retained for destruction should be achieved through expanded compliance with EU regulations, namely:

- Enterprises operating equipment containing a fluid charge of 3 kg or more shall keep a record of the quantity and type of substance recovered and added, and of the company and technician which performed the maintenance or servicing.
- Enterprises using reclaimed or recycled HCFC for maintenance or servicing shall keep a record of the undertakings that have supplied reclaimed HCFC and/or the source of recycled one.

2.7 Review of HCFC and Alternative Consumption by Sector

2.7.1 Foams Sector

The PU sector in Bulgaria is not well developed. There is one manufacturer of automobile, truck and forklift seats, two small manufacturers of foamed (insulated) district heating pipes and several small manufacturers of PU panels and doors. There are no system-houses operating in Bulgaria.

The main ***polyurethane (PU)*** sectors using refrigerants as foaming agents are rigid insulating foam production and flexible integral skin foams. Hydrocarbons (HC) are often used as an option to HFCs and HCFCs for polyurethane foam applications. HCs are not suitable for small and medium installations due to the significant safety requirements. Water is also often used in certain application, as well as HFCs (HFC- 245fa and HFC- 365mfc).

The recent legislative changes in construction and design has led to increased demand for XPS (extruded polystyrene) foams. European producers usually use HFCs (HFC-152a), CO_2 and/or water instead of HCFC, which is also the trend in Bulgaria. The largest producer in the country is Fibran Bulgaria, which produces XPS boards using HFC-152a and HFC-134a as blowing agents. Several new manufacturing plants have been commissioned in the country in 2006-2008, all of which use HFCs or natural blowing agents. There is no legal (reported) HCFC foam use in the country due to the ban on its use in manufacturing in the EU.

In sandwich panel production, there are a few new players in this industry, and a number of existing ones have abandoned it. Metecno Bulgaria (subsidiary of Metecno- Spain) has opened a factory in Pleven, and TechnoPanel has established a new production plant near Sofia. Both factories are using up-to-date equipment and natural blowing agents (Pentane).

There is significant number of manufacturers of water heaters in Bulgaria, but only a few of them use PU foam for the insulation of the vessels. Smaller companies use mineral wool and other hand-applied products, and larger ones use automated, high-capacity foaming lines.

There are a few companies which offer equipment and chemicals for spraying of polyurethanes. All of them use pre-fabricated systems (polyol/ foaming agent mixture and isocyanate). They import most of the mixtures from other EU member states (Netherlands, Italy, Spain) and use F-gases HFC-245fa and HFC-365mfc as foaming agents. The largest players in the industry are Pluimers Insulation- Varna, Futura Construction Polymers- Sofia, A&G Invest Ltd. – Sofia.

Table 15. Major Foam applications in Bulgaria

Company	***Industry***	***Blowing agent***
Liebherr Husgeraete Marica	Domestic appliances	c/i Pentane
Fibran Bulgaria	XPS panels	HFC-152a/ HFC-134a
Metecno Bulgaria	Sandwich panels	n-Pentane
Technopanel	Sandwich panels	Pentane
Eldom Invest	Water heaters	HFC-365/227 (converted from HCFC-141b)
TESY	Water heaters	CO_2 (water)
Install Engineering	Pre-insulated pipes	CO_2 (water)
AVKO	Pre-insulated pipes	CO_2 (water)
Dilovix	Pre-insulated pipes	HFC-365mfc
A&G Invest	Building insulation (spray applications)	HFC
Futura Construction Polymers	Building insulation (spray applications)	HFC
Pluimers Insulation	Building insulation (spray applications)	HFC
Cool Star	Refrigerated displays	CO_2 (water)
Climat- Incom, Sofia	Refrigerated displays	c- Pentane

2.7.2 Refrigeration and Air Conditioning Sector End Use

The majority of HCFC and alternative end use in the country is in **commercial refrigeration**, both in direct and air conditioning applications. The predominant refrigerants used are now HFCs, primarily HFC-134a and HFC-404a. There is also growing number of refrigerated transport applications, mainly road transportation vehicles. Main operators are the ice-cream and milk producers as well as suppliers of frozen fruits and vegetables. Third- party logistic (3PL) companies are still not significant players in the market, but we can expect future growth of their activities in the country due to the trends of consolidation of retailers and the need for

efficiency improvements in the supply chain. The majority of applications use HFCs although some HCFC-22 is also used.

The ***industrial sector*** has experienced steady growth in the last decade, partly due to the financing opportunities from the EU funds and partly due to the high demand in food processing and general industry. Significant refrigeration capacity has been installed throughout the country, most of it with origin from the EU, which has resulted in the significant increase of the quantity of modern, energy-efficient and environmentally friendly equipment. The most commonly used refrigerants in small and medium-sized industrial refrigeration equipment are HFCs, and in large refrigeration systems ammonia is widely applied.

For chillers with reciprocating, screw and scroll compressors, used in air-conditioning and technological cooling applications, HCFC-22 has been succeeded by HCFC-134a or HCFC-410a, and HCFC-407C has sometimes been used as a transition refrigerant. Main applications of large-scale air conditioning equipment can be found in the hotel sector, shopping malls and congress centres and meeting halls. There are also a few factories which have been air-conditioned, but they are more an exception than a rule. Chillers are also often used for technological cooling in applications such as injection moulding, extrusion, etc. Overall in the industrial sector, there is still significant number of installations using HCFC-22, especially ones installed more than five years ago.

Concerning the smaller hotels, the standard there are the split-type air-conditioners, which contain small quantity of refrigerant. There is a substantial proportion of HCFC- charged units there, as in procurement the items significant priority has been paid to purchase price and a large proportion of these units were imported from China and Turkey in the last years before the ban of the import of HCFC equipment in Bulgaria.

Given the substantial amount (approx. 102 MT) of estimated stockpiled HCFC-22 in small split-type and window air-conditioners not subject to the reporting

requirements and by anticipated leakage rate of 15 %, the service demand only for this group of products will exceed 15 MT in each of the next five years.

Table 16. Small A/C HCFC applications

No of small split system A/C	Percentage of HCFC systems	Average HCFC-22 Charge, *[kg]*	Total quantity of HCFC-22 in small split type A/C, *[kg]*	Average annual leakage rate	Total annual service demand, *[kg]*
380 000	34	0.8	103 360	0.15	15 504

2.7.3 Refrigerated Equipment Manufacturing

The market of domestic refrigerators and freezers in Bulgaria is about 200 000 units per year. The majority of them use R-600a (iso-Butane) as a refrigerant, and a smaller part uses R134a. Most of the units are imported from the EU or Turkey. The import of second-hand refrigerators, which was very popular a decade ago, is negligible nowadays.

The industrial production of domestic refrigerators in Bulgaria is about 600 000 units per year, all of them using R-600a as a refrigerant and a mixture of cyclo- and iso- Butane as a foaming agent.

Energy efficiency labeling is obligatory, and as a result of the increase of electricity prices and intense publicity of issues related to the energy efficiency of home appliances, customers have started looking for higher-rated products.

Table 17. Domestic refrigeration appliances manufacturing in Bulgaria

	Blowing Agent	Refrigerant
Liebherr Hausgeraete Marica	c/i Pentane	i-Butane (R 600a)

In commercial refrigeration, Bulgaria has experienced rapid growth of the supermarkets in the last five years, which resulted in increased refrigeration capacity as well. Major European retailers have entered the Bulgarian market and have installed new equipment, operating exclusively with HFC refrigerants. However, as a whole, the retail market is still very fragmented, with a significant proportion of small, family-run outlets, and older inefficient refrigeration

equipment. As a consequence of the new investments in the sectors, smaller shop owners are forced to improve the customer appeal and attractiveness of their shops.

Table 18. Small commercial refrigeration applications in Bulgaria

No of small refrigeration units (< 3kg refrigerant charge)	Percentage of HCFC systems	Average HCFC-22 Charge, *[kg]*	Total quantity of HCFC-22 in small split type A/C, *[kg]*	Average annual leakage rate	Total annual service demand, *[kg] HCFC-22*
80 000	15	1.8	21 600	0.18	3 888

This sector saw the import of significant quantities of second-hand equipment, mainly using HCFCs, but this has largely been eliminated. Most of the old HCFC equipment is expected to be replaced in the next few years, and HCFC-22 service demand for this type of equipment will likely decline rapidly. Currently, all new equipment is HFC based, including that supplied by the five national manufacturers (Table 19) As yet, Hydrocarbons and CO_2 installations are practically not present in the country.

Table 19. Manufacturers of small commercial refrigeration applications in Bulgaria

	Products	Blowing Agent	Refrigerant
Climat- Incom, Sofia	Displays	c-Pentane	HFCs
CoolStar, Varna, tel:		H2O	HFCs
Brist-HM		c-Pentane	HFCs
Fai Service	Displays	-	HFC
NAGI- Krichim, tel: 03145/ 4059	Displays		HFC

2.7.4 Refrigeration Servicing Sub-Sector

The refrigeration servicing sub-sector is highly dispersed, dominated by small, local players. There are a few large companies and a large number of small companies with less than 5 employees.

There are about 1000 certified technicians (data updated on 01 Dec. 2009) and 70 licensed refrigeration service companies in Bulgaria. The actual number of refrigeration service technicians and companies is higher, but a part of them service

only low refrigerant charge RAC units and installations (with refrigerant charge less than 3 kg./6 kg. in hermetically sealed systems) normally used by households or small business where the awareness for the regulations in the field is lower and there is no obligation for performing regular checks.

This group of stakeholders will be particularly important for the successful HCFC phase out. Technicians and companies who are well trained and understand the environmental impact of their actions and are subject to penalties due to non-compliance with national or EU legislation are going to be less susceptible to be involved in illegal trade of virgin HCFCs after 01 January 2010, and will be able to influence equipment operators to retrofit their HCFC installations in an environmentally acceptable refrigerants.

Stricter enforcement of the regulation could improve reporting and traceability of refrigerant supply chain within the country and guarantee that no ODS or greenhouse gases are released in the atmosphere due to insufficient qualification and awareness of technicians or unavailability of specialised tools. This would force technicians who want to stay in business to go to training and get certified, and will help to improve the quality of data received by the annual reporting of quantity of refrigerants used.

2.7.5 Other Sectors

Fire protection equipment is the most common application of halons in industry. Halons, except the ones used in critical applications (Annex VII of Regulation (EC) No 2037/2000) have been phased out in 2006-2007 in accordance with European Regulation (EC) No 2037/2000. The halons have been properly collected and stored, and the MOEW has granted a license to a firm which will collect the quantities from the places where they have been stored, and will transport them out of the country for disposal or re-use.

There are no reported ***solvent*** applications involving HCFCs in Bulgaria.

2.8 Summary and Conclusions

The HCFC refrigerants in Bulgaria remain in use primarily in the food preparation and distribution chain (cooling, freezing, cold storage, transportation and retail), air-conditioning and technological cooling in industrial sectors such as processing of plastics. There is no production of HCFC-containing products in the country. Despite the fact that most of the substances used in industrial refrigeration are HFCs and NH_3, there are still substantial banks of HCFCs, primarily in HCFC-22 containing refrigerated equipment which is in operation in the country.

The only demand for HCFCs is in servicing existing installations. There are no legal applications in other potential areas such as foams, aerosols, or fire extinguishing.

3.0 Survey Results Analysis

3.1 Trends and Demand Forecast

A summary of the data for refrigerant banks reported to the RIEW for 2008 (Annex VII) is provided in Table 20.

Table 20: HCFC and HFC usage in refrigeration in Bulgaria (refrigerant banks), 2008

	HCFC, *[kg]*	**HFC, *[kg]***	**Remarks**
Commercial refrigeration	28 035	53 775	43 780 kg. NH_3 reported despite it is not required by Regulation (EC) No 842/2006. The actual quantity NH_3 in large refrigeration installations is much larger.
Industrial refrigeration	1 084	1 002	Very low quantity reported, perhaps due to lack of awareness
Refrigerated Transport	188	233	Reporting is voluntary, not required by Regulation (EC) No 842/2006.
AC and HP	17 149	21 674	
TOTAL:	***46 456***	***76 684***	

HCFC consumption in Bulgaria in 2008 was 66.8 MT based on import and export reporting. All suppliers are companies with traditions and reputation in this business, and they are aware of their obligations to declare the substances and quantities they have traded. As a consequence a relatively high level of confidence can be placed in these "top down" derived estimates. However, as the products go down the supply chain to smaller wholesalers, services and users, their awareness and knowledge of the obligations they have decreases, hence a relatively low compliance rate for declaration of refrigerant usage (banks).

The "bottom up" survey results based on analysis of and supplemental survey investigation of end users of refrigeration and A/C equipment shows that a much lower consumption exists. An evidence to support this is the low quantity of reported banked HCFC in existing equipment: 46.5 MT as summarized in Table 20 and elaborated in the summary tables in Annex VII.

Assuming a 15% leakage annually, this would mean annual consumption of 7.0 MT for servicing the equipment. To this number we should add the anticipated service demand for small A/C installations (15.5 MT) and for small commercial applications (3.9 MT), which results in 26.4 MT of HCFC-22 for servicing. This

covers less than 40 per cent of the 66.8 MT of HCFC-22 consumption in the country (based on calculating import-export). According to estimates, the annual demand for HCFC-22 for servicing the existing installations in 2009 is about 42 ODS tones (2.3 ODP tones).

Table 21: HCFC-22 Servicing Demand Forecast for Bulgaria, 2009-2015

	2009	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***
Servicing demand (ODS tones)	42.0	37.0	32.5	28.6	25.2	22.2	19.5

As most of the HCFC-containing equipment in the country is commercial refrigeration and small A/C equipment, both of which have shorter lifetime than industrial equipment, it is very likely that it will be possible to accelerate this phase out scenario by effective enforcement and encouraging users to develop refrigerant management plans and apply for funding by available environmental or energy efficiency programs.

It should also be noted that the current import based estimated consumption may be inflated by stockpiling of virgin HCFCs for use after the ban of virgin HCFCs in Jan. 2010. Further analysis of 2009 imports should be undertaken to evaluate the magnitude of this.

3.2 Availability of reclaimed HCFCs

European manufacturers began reducing the production of HCFC refrigerants and distributors have reduced the stock in their supply chains in 2009. Contrary to the logic of possible scarcity and price increase, virgin HCFC-22 had been widely available on the market until the very end of 2009, without any signs of scarcity or insufficient supply.

In theory, only reclaimed HCFC-22 will be legally available in commercial quantities after 01 January 2010. However, there are no reliable figures on the amount of reclaimed material that will be available in practice. This will depend on the number of conversions carried out, and the purity of product returned. According to estimates, the supply of reclaimed HCFCs will cover not more than

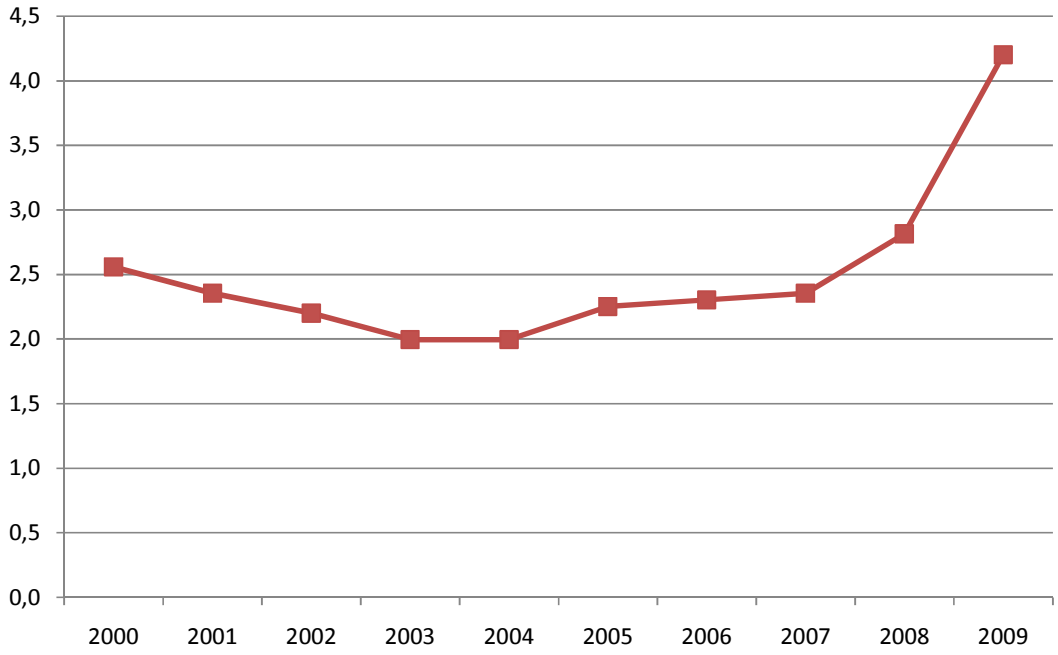
15% of the demand for servicing. This is likely to cause the cost of HCFC-22 to escalate. As there are expectations that there are significant quantities of HCFCs (HCFC-22) banked by smaller wholesalers and services, the shift of its price will be gradual and will grow with time.

As refrigerant prices rise in future, reclaiming refrigerants will become more financially attractive. This likely will result in reclaimers offering incentives for recovered refrigerant. This should prompt firms and their contractors to handle their used HCFC-22 more carefully, such as monitoring and quickly stopping leaks and instituting other responsible use measures.

3.3 Prices

Historical data for virgin HCFC-22 (EUR without VAT) prices is given in Figure 5.

Figure 5. Virgin HCFC-22 Price in Bulgaria (EUR), 2000-2009



According to data provided from refrigerant wholesalers, the market price of HCFC-22 has been stable in the last year (2009): 4.20 EUR/kg without VAT. Despite expectations for price increase, there has been no increase in its price in the last months of its legal usage. This could be caused the fact that the price increase

has been consumed at the beginning of 2009, when refrigerant manufacturers have increased their prices with 15-20%.

3.4 Technology Options

It is apparent that reliance on reclaimed HCFC-22 is a very risky strategy for businesses, not only because the quantity of recycled/reclaimed will not be enough to meet demand, but also due to the potential for variable quality of refrigerant which is likely to cause technical problems and even business interruptions.

In any event, all HCFC-22 plants effectively should be converted in the short/medium term (less than 5 years) due to the inability to be serviced after the ban of recycled/reclaimed HCFCs in 2015.In this situation end users have the following alternatives:

1. Convert existing equipment to operate with a "retrofit" HFC refrigerant.
2. Replace existing equipment and move to a natural refrigerant or HFC refrigerants.
3. Continue operating the existing HCFC-22 facility baring the risk of refrigerant shortages, variable quality of refrigerant and uncontrollable cost increase.

The best decision for each installation depends on a number of factors such as the age, working life, general condition, operating costs, refrigerant used and application of the equipment.

Conversion costs will also vary widely, depending on system, application, design and other application specific considerations, but new, tighter systems can help offset refrigerant investment costs through reduced servicing needs in the long term. In addition to capital costs, other costs will be incurred due to the need to shut down facilities during retrofit/replacement. Changes in expected energy consumption (operating expenses) and long-term environmental and safety issues have to be considered and cost/benefit analysis has to be carried out to choose the most appropriate option. While HFCs have a higher GWPs than natural refrigerants,

new systems are generally more energy-efficient and leak-tight than older systems currently in use, and the environmental impact may be positive.

Early switch-over to non-ODS refrigerants will be particularly attractive in terms of economic and environmental benefits in large refrigeration systems or installations with high leak rates (exceeding 20% annually).

3.5 Environmental Impact

With respect to the existing bank of HCFC equipment, environmental impacts are minimized by containing and using refrigerants responsibly - that is, by recovering, recycling, and reclaiming, and by reducing leaks. This reduces both the ozone depletion and global warming consequences for existing HFC based equipment as well as any cases where HFCs are used for retrofit or replacement. With proper servicing, systems using HCFC or HFC refrigerants will minimize their impact on the environment. System leaks can not only harm the environment, but also result in increased maintenance costs, and repairing or replacing systems because of leaks is an economically feasible option.

An important thing an installation operator/owner can do for the environment is to select a reputable service company which is licensed to perform refrigeration installations service and that employs technicians who are certified to handle refrigerants in accordance with Regulation (EC) No 303/2008, concerning the minimum requirements and the conditions for mutual recognition for the certification of companies and personnel. Certification is granted by the Bulgarian Branch Chamber- Machine- Building and certifies that the EU-wide minimum training and equipment availability requirements for safely handling refrigerants are met and releases of ozone-depleting chemicals in the atmosphere will be minimised.

Given the ban of virgin HCFCs in 2010 and the resulting increased economic and operational risks of running HCFC containing systems, owners should start looking for feasible alternatives. In this regard, end users should examine the viability of using natural refrigerant systems where commercially available, recognizing both the environmental impact and likely longer term future restriction of HFC use. Similarly new, energy-efficient systems can result in cost savings due to lower energy and maintenance costs and bring environmental benefits compared to the older technology systems.

3.6 Compliance Analysis

Bulgaria has successfully moved from a traditional Article 2 Country with an Economy in Transition (CEIT) in terms of ODS phase out to one that is advanced in terms of meeting MP obligations as defined by the MP accelerated phase out requirements, but still has issues associated by the EU regime that the country may need assistance to address.

In comparative terms globally, the country's consumption of HCFCs is at a level equivalent to 5% of its MP baseline, which is well within the 25% level required in 2010 and the 10% level in 2015. This makes it a leading Article 2 country in terms of MP compliance and very likely to have fully phased out HCFCs before 2020.

There are no significant manufacturing sector issues associated with HCFC consumption in the country. The current estimated HCFC consumption (67 MT ODS in 2008) is exclusively used in the refrigeration servicing sector for the decreasing inventory of HCFC equipment (current bank of refrigerant inventory of identified equipment is 25% HCFC by volume) which reflects a reasonably modern refrigeration sector. The country does not have to deal with the major issue facing most countries- namely the large quantity of relatively new HCFC equipment that countries grow, hence expanding instead of contracting HCFC demand.

A substantial part of HCFC banks are in the small A/C sector, with refrigerant charges less than 3 kg., which are not subject to reporting regulations.

In terms of reporting coverage, the current system intended to monitor HCFC and more broadly F-gases use has not yet achieved an effective coverage level. The results indicate that coverage is not more than 40 %. Therefore, the actual detailed understanding of where HCFCs are used, what is the service demand, and how long it may be sustained, is limited. This is attributable to limitations in regulatory enforcement capacity and general low awareness of the reporting obligations by users.

Recognizing that sustaining HCFC supply needs until 2015 will be dependent on recycled and reclaimed HCFC, current levels of reclaim are very low and will

not be able to meet demand. This may result in substantial price surge and create motivation for illegal import of virgin HCFC from neighbour countries.

The requirements for certification of servicing technicians and regulation (licensing) of enterprises undertaking servicing have not extended beyond larger firms leaving a significant part of the sector (especially technicians servicing small RAC installations) not adequately covered and a significant risk of poor practice and illegal use of HCFCs.

Limitations exist in the capacity of custom' authorities to adequately control the import of both HCFCs and HCFC containing equipment exist which given direct border access to Article 5 countries where HCFCs will remain both readily available and cheap, this creates a significant risk of illegal trade into the country and EU generally, particularly from bordering non-EU countries such as Macedonia, Turkey and Serbia.

There is an absence of infrastructure to capture, store and dispose of waste ODS which will increase in volume. There is a need for at least a secure storage option, likely subsidized by government to prevent general venting.

3.7 Summary and Conclusions

Members of the EU (including Bulgaria), working in agreement with the measures taken by the MP to protect the ozone layer banned the use of HCFCs, including the use of equipment requiring these refrigerants. While the use of virgin HCFC to service refrigeration and air-conditioning equipment has been permitted up to the end of 2009, from the 1st January 2010 virgin HCFC used for RAC will be illegal, even if it was obtained before the ban date.

The EU regulations and legislation concerning the MP are already in force in Bulgaria. Consumption of HCFC is declining, but is still quite substantial compared to the reported HCFC-containing equipment in the country. This means that the reporting and data collection still does not cover the majority of the refrigerant users. Measures should be taken to increase the awareness of businesses for the reporting obligations they have to the RIEW and make the data base of bank

refrigerants much more comprehensive. This will be necessary if the rapid phase out of HCFC use is to occur by 2015 and in the longer term effective controls on HFCs are to be implemented.

Despite the fact that recycling and reclamation facilities are already available in the country, recycling/reclamation rate is very low. This raises the question how efficient will be the enforcement of the ban of use of virgin HCFCs, which will be in place from the beginning of 2010. It is very likely that some services and users will continue using virgin material which is banked in the country, possibly mislabelling it as reclaimed one, or which is illegally imported. For this reason it will be critical RIEW inspectors to control the records of recycled/reclaimed refrigerant and verify the sources of these gases.

Inspectors of RIEW should work actively to enforce the regulations by controlling the recycled/reclaimed material supply chain and identify higher risk wholesalers and services.

Customs officers should be trained in order to be able to identify potential smuggling channels from non-EU neighbour states. This is particularly critical recognizing that there will be a substantial demand for illegal HCFCs, and particularly HCFC-22 after 01 Jan. 2010 and that it will be readily available at relatively low prices in neighbouring Article 5 countries.

While for large industrial companies it will be easier and cost-effective to implement and finance HCFC-22 phase-out plans, HCFC demand will be driven by small AC installations and small commercial refrigerated equipment owners. Small RAC equipment owners are not covered by the state's licensing and reporting system, and are expected to be the major user of illegal HCFCs.

That is why it is critical to increase the awareness of the broader public for the environmental problems and the ban on virgin HCFCs. In case of escalating reclaimed HCFC costs and the taking into account the lower price and higher energy efficiency of the new equipment, replacing the old equipment will be a cost-effective option. Equipment replacement discounts could provide attractive

incentives and contribute to the timely reduction of HCFC banks. Additionally, it may be necessary to more aggressively require certification of a broader range of technicians and extend certification/registration requirements to smaller scale applications.

4.0 Recommended HCFC Phase-out Strategy and Actions 2010-2015

If the country takes no action to facilitate HCFC phase out, the likely scenario is that in the near term (next couple of years) the current gradual replacement of this equipment will occur but the service sector will use illegal material, potentially disguised as reclaimed to maintain what remains. After that if and when enforcement is applied, HCFC equipment will simply be abandoned/replaced because it cannot be serviced with significant potential economic and convenience impacts, particularly to the general population and small retail sector. This strategy in fact may work as far as HCFC phase out is concerned and ultimately meeting the EU target. However, it could be economically damaging and not address the environmental implications of high emissions or any anticipatory action on high GWP refrigerant use. For this reason and the overall need to meet its obligations under EU legislation, the action by the government in the following areas is recommended.

4.1 Increasing Awareness

The HCFC phase out management planning issue appears to have a low profile generally and particularly with those most impacted, namely end users, even though all legislation concerning the ODS and F-gases is available on the web site of the MOEW in English and Bulgarian. This lack of awareness can be addressed by a focused campaign stating the implications of having to eliminate HCFC use and ultimately HCFC based equipment over a five years period. The elements of this would be a range of information dissemination tools. Best results could be achieved if there are some non-government organizations that could partner in this- industry associations or consumer organizations.

Best practices related to HCFC retrofits and replacement need to be made available to end users. This should underline the urgency of taking such action recognizing that continued use on a suitable basis of HCFC equipment will not be possible or at least economically feasible. In this regard, refrigeration service

companies and refrigerant importers/ distributors should be encouraged to disseminate their positive experiences and encourage others to follow.

The information on the availability of refrigerant recycling and reclamation facilities in the country should be disseminated to end users and more broadly to refrigeration servicing operators, including direct advice on the likely implications of not actively pursuing servicing strategies based on recovery, recycling and use of reclaimed refrigerant, namely no other legal alternative. Creating a targeted web site, containing the national and European legislation concerning the HCFCs and HFCs as well as other useful information such as addresses of companies certified in accordance with Regulation (EC) No 303/2008, companies with recycling/ reclamation capacity and industry best practices will be very useful tool and source of up-to-date information for the industry and other interested stakeholders.

4.2 Strengthening Enforcement

Bulgaria's ability to eliminate HCFCs in the next five years depends on the present banks already existing in the country, as inventory of HCFC equipment is not growing. The country, as a member of the EU, has adopted all community-wide legal and regulatory measures related to the control of HCFC imports and use. Important in the next five years will be to secure the adequate enforcement policies and the necessary capacity to implement these measures. Crucial roles will be played by RIEW inspectors and customs officers, who have to restrict the inflows of illegal imports and control the countrywide supply chain of recycled/reclaimed HCFCs. RIEW inspectors also have a key role in enforcing equipment registration and record keeping requirements. It will take a top down government commitment to apply the power and sanctions available as well as the financial commitment to resources needed to do it- mainly in terms of organising training and purchasing detection equipment.

Training of RIEW inspectors and customs officers in issues regarding Regulations (EC) No 1005/2009 and 842/2006 and their practical applications will help to decrease the illegal import and usage of ODS and accelerate the phase-out of

HCFCs. Equally important and linked to the following actions respecting information and awareness is the role of RIEW inspectors and the MOEW generally have in ensuring that registration of HCFC and HFC equipment is comprehensive.

4.3 Information Management

A key support tool for enhancing awareness and strengthening enforcement with respect to the current low level of registration and reporting applied to end user installations would be improved information management. This should start with a review of current reporting practices, particularly things like consistency of the reporting format, increasing traceability and expanding the scope of reporting. It could be further facilitated by an integrated electronic information management system covering installations containing ODS and fluorinated greenhouse gases generally. The system would help to standardise the data input and connect the RIEW offices with MOEW, and will facilitate the traceability of data and help to address the reporting requirements of the MOEW to the EC. This would also improve the communication with owners and operators, traceability and control of consumption and real-time reporting in changes of the status of installations (commissioning, charging, operation, servicing, de-commissioning)

4.4 Strengthening Servicing Training

The MOEW, together with Bulgarian Branch Chamber- Machine building, has already organised and carried out certification and licensing of technicians and service companies in accordance with Regulation (EC) No 303/2008. This includes a registry of licensed technicians and firms, as well as a list of all licensed training centres is available on the web site of Bulgarian Branch Chamber- Machine building.

Training of technicians should be expanded to increase the numbers of technicians certified beyond its relatively low level and for already certified technicians updated training and seminars related to the environmental impact of

responsive refrigerant management and installation maintenance (particularly recovery/recycling/reclaim priorities), more examples and good practices in repairing and maintaining systems, use of alternative technologies and equipment (particularly low GWP refrigerants), converting existing facilities (drop-in and retrofitting) and record-keeping related maintenance/servicing logs and reporting management system requirements.

This will involve efforts aimed at expanding the network of training centres countrywide and increasing the awareness of businesses for the requirements of the Regulations. Large refrigeration installations users now must use certified technicians and service companies and these requirements need expansion to the sector generally.

Training and information dissemination activities in the refrigeration servicing sector should also be linked to training undertaken for other stakeholders, particularly RIEW inspectors who are responsible for carrying out regular control on the reporting systems for leak testing and servicing carried out by operators/owners. Similarly, independent construction and consulting companies should be included given their role in construction process, and need to require licenses from companies installing or modifying RAC equipment. This will force all major installation companies to train their technicians and get licenses to work with refrigerants.

4.5 Developing Enterprise Refrigerant Management / Replacement Plans and National Refrigerant Management Strategy

Given that most RAC systems leak to a certain degree, users of HCFC systems must develop a plan to manage their operations without virgin refrigerants. Doing nothing is not a sustainable option, and given the serious implications and potential costs of serious faults and operation disruptions, businesses should follow a more strategic approach and develop RMPs.

It is recommended that specific requirements be introduced requiring all HCFC refrigerant end users covered by the EC registration requirements to prepare a

formal plan on how they will manage refrigerant through to its replacement over the next 5 years. This would apply particularly to operators/owners of large HCFC installation or ones with high refrigerant leak rates. Annex VI provides general background on what these plans would entail and the issues they should address.

At a national level it is also recommended that a national refrigerant management strategy be developed, which could support and guide the development of an enterprise specific RMP for all major refrigerant users as a formal regulatory requirement applied to HCFC and HFC based equipment users in the large commercial, industrial, A/C and transportation sectors. It might be supported by a national technical advisory capacity (designated institutes or individual technical experts along with resource material) that provide advice on retrofit and replacement options. This should be strongly oriented to low GWP alternatives as applicable, recognizing the global trends. It would also support more immediate priorities such as leak detection and the capture and containment of used/waste refrigerant for environmental sound disposal.

Due to the high costs of transporting ODS for disposal abroad, there is risk that certain users may vent banked HCFC refrigerants to avoid paying for disposal. As a result, creation of a country-wide framework for collection and secure storage is also urgently required, including investigation of environmentally sound disposal of ODS in the country which may lower the ultimate costs as well as permanently eliminate the risk of emissions in the atmosphere. A specific sub-set of the national refrigerant management strategy should be the development of national capacity to capture and securely store (and potentially dispose of) waste ODS. This will have to be publicly stimulated and subsidized, but also represents a good public/private partnership opportunity.

4.6 Funding Opportunities

Training of RIEW inspectors and customs officers have to be funded (at least partly) by the national government as part of its commitment to HCFC phase out. However, if the country can elaborate a strategy outline and show some government

support, it is reasonable to seek EU co-financing for its implementation or specific elements of it. Some early opportunities for this might be in training and technical assistance related to establishing the national RMP concept.

Significant capital expenditures will be required in the next five years from end users as well. Incentive programs or preferential funding to replace/retrofit equipment may be made available to industry by EU-funded programs, environmental and energy efficiency programs. Discussion between the MOEW and the Ministry of Economy and Energy as well as the Ministry of Agriculture and Food should be carried out to determine the opportunities for financing of such projects from national or international funds.

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Annexes

Annex I. List of national legislation, regulations, applicable amendments and other official measures related to the control of ODS currently in effect and under development or planned.

No	*Title*	*Document Reference/ Year of Approval*	*Description*
Measures In Place			
1	Designated control authorities	***Clean Air Act/ 2006***	Minister of Environment and Water or the Director of the Regional Environmental Inspectorates are responsible for the control of production, import/export, use, placing on the market of ODS, F-gases and products and equipment containing or relying on those substances. (Regarding stationary RAC systems, heat pumps, mobile AC systems, installations containing solvents, high voltage switchgears). Director of the Fire and Emergency Safety to the Ministry of Interior is responsible for the control of production, import/export, use, placing on the market of F-gases and products and equipment containing or relying on those substances. (regarding the stationary fire protection systems and extinguishers)
2	Certification requirements for personnel and companies	***Regulation (EC) No. 2037/2000*** on substances that deplete the ozone layer (in force since 2007); ***Clean Air Act*** (last amended in 2008); ***Ordinance for the control and management of substances that deplete the ozone layer*** (last amended in 2008)	Certification of personnel and companies performing leak checks, installation, recovery, servicing and maintenance of RAC systems.
3	Regularity of conducting of Leak checks	***Regulation (EC) No. 2037/2000*** on substances that deplete the ozone layer (in force since 2007); ***Ordinance for the control and management of substances that deplete the ozone layer*** (amended in 2002 and 2006)	Obligatory leak checks (once per year) of RAC systems containing more than 3 kg of refrigerant and maintaining a dossier of the system (in force since 2002). In 2006 were introduced more stringent measures – frequency of the leakage checks according to the fluid charge in RAC systems (for ODS and F-gases[12])
4	Licensing system for import/export	***Regulation (EC) No. 2037/2000*** on	Currently the European Commission issues the import/export licenses in compliance with

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Ordinance on establishing implementing measures of Regulation (EC) No. 842/2006 on certain fluorinated greenhouse gases (State Gazette, issue 3/13.01.2009)

	of ODS	substances that deplete the ozone layer (in force since 2007) ***Ordinance for the control and management of substances that deplete the ozone layer*** (amended in 2002 and 2006)	Regulation (EC) No. 2037/2000. With the amendment of the Ordinance for the control and management of substances that deplete the ozone layer in 2002 the import and export of ODS and products and equipment containing ODS has been allowed through 20 customs points only, equipped with ODS identifiers.
5	Establishing an information system	***Regulation (EC) No. 2037/2000*** on substances that deplete the ozone layer (in force since 2007) ***Clean Air Act*** (last amended in 2008) ***Ordinance for the control and management of substances that deplete the ozone layer*** (last amended in 2008)	***Importers/exporters*** report directly to the EU Commission with a copy to MOEW. ***Users*** report annual information to the Regional Inspectorates on Environment and Water (RIEW) including: quantities purchased (virgin, recycled, reclaimed), used, stored. Processing undertakings annual information to RIEW on processed quantities of ODS (recycled, reclaimed), source of ODS, stored ODS ***RIEW*** summarize the information and send it to MOEW. Customs agency provides information on imported/exported ODS as well as on proved cases of illegal trade.
Measures Under Development			
1	Ban on import/export of products and equipment containing or relying on ODS	Recast Regulation on substances that deplete the ozone layer (will be in force from 2010)	Currently under Regulation (EC) No. 2037/2000 only the import of equipment containing ODS is forbidden. It has been a loophole in the regulation which will be changed with the new ODS regulation. From 2010 the import /export of equipment relying on ODS will be forbidden as well.

Annex II. List of agencies, institutions and organization involved in the regulatory, economic development, market promotion, technical/scientific activities related to ODS and specifically application of HCFCs or alternative technologies

No	Name of agency, institution, or Organization	*Contact Information* (Address, Telephone, Fax, Web Site, Contact name/position/E-Mail)	Description of role, activities and capacity
1	Ministry of Environment and Water with its Regional Inspectorates (local authorities)	67, William Gladstone Str. Sofia 1000 Tel: +359-2-940-6204 Fax: +359-2-981-0954 www.moew.government.bg Contact: Mrs. Irina Sirashka-Palova, Senior expert, National Focal Point for Vienna Convention and MP Email: Sirashka@moew.governemnt.bg air@moew.government.bg	Competent Authority for the implementation of the International Environment Treaties regarding the ozone layer protection (Vienna Convention and Montreal Protocol), European legislation (ODS and F-gas regulations). Activities: control of ODS and F-gases as well as of products and equipment containing these substances; collecting and reporting information, raising awareness, etc.
2	Ministry of Transport	9, Dyakon Ignatiy str.; Sofia 1000 Information: +359-2-940 - 9771 Lounge: +359-2-940 - 9640 phone/fax: +359-2-988 - 5094	Competent authority regarding the critical use of halons in aircrafts.
3	Ministry of Defense	3 Dyakon Ignatiy str., 1000 Sofia BULGARIA Tel.: 02 92 20 922, web: www.mod.bg Contact: Mr. Jenko Jenkov-Head of department Expert on Environmental issues to the Bulgarian Army Tel: +359-2-9228-658 Fax: +359-2-9977-144 Email: jenkojenkov2005@abv.bg	Competent authority regarding the use of halons for critical uses in military applications.
4	National Service for Plant Protection to the Ministry of Agriculture and Food supply	17, Hristo Botev Blvd. 1606 Sofia *tel*: +359-2-9173-702, 953-41-16 *fax:* +359-2-952-0987 http://www.nsrz.government.bg/ Contact: Mr. Nikolay Rosnev "Phytosanitary control" Department tel: +359-2-9173-759 fax: +359-2-9173-759 Email: fsk@nsrz.government.bg	Competent authority regarding the use of Methyl bromide for quarantine and preshipment.
5	Bulgarian Drug Agency	26 Yanko Sakazov Blvd. 1504 Sofia tel: +359-2-943-4046 fax: +359-2-943-4487 email: bda@bda.bg	Competent authority regarding the use of ODS for essential uses in metered dose inhalers.
6	National Customs Agency (to the Ministry of Finance)	47, Rakovski Str. Sofia 1202 Tel: +359-2-9859-4213 - Public Relations Dept. http://www.customs.bg/en/ Contact: Mrs. Kaya Garabedian Head of Non-Tariff Measures Department Tel: +359-2-9859-42-71	Control of import/export of ODS and F-gases as well as of products and equipment containing those substances. Customs Agency provides annual information to MOEW according to Art. 20 of Reg. 2037/2000.

		Fax: +359-2-9859-40-67 Email: Kaya.Garabedian@customs.bg	
7	Bulgarian Chamber of Machine Building	29, Alabin Str., floor 1 Sofia 1000 Tel: +359-2-988-40-44, 988-2765 Fax: +359-2-989-28-06 email: bbcm@mail.com, bbcmb@abv.bg http://www.bbcmb.dir.bg/ Contact: Mr. Ilya Keleshev Chairman	Designated certification body for personnel and companies according to Regulations 2037/2000 and 842/2006. Activities: Evaluating personnel according to Reg 303/2008 (organize examinations); Issuing of certificates Raising awareness among companies through organizing seminars.
8	Chamber of Engineers in Investment Design	Hr. Smirnenski blvd No.1, er. 4, 41164Sofia, htpp://www.kiip.bg	Design of Refrigeration and HVAC installations

Annex III. List of HCFC substances controlled by the Montreal Protocol

*(**Source:** ODP values - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer Seventh edition (2006), Ozone Secretariat, " Annex C, Controlled Substances". GWP values, WMO (World Meteorological Organization), Scientific Assessment of Ozone Depletion: 2006, Global Ozone Research and Monitoring Project—Report No. 50. GWP values represent direct radiative forcing using a 100 year time horizon. Atmospheric lifetime values, WMO Scientific Assessment of Ozone Depletion: 2006, Global Ozone Research and Monitoring Project—Report No. 50.)*

Substance	*ASHRAE Code*	*Chemical name*	*Chemical formula*	*ODP**	*GWP*	*Lifetime (years)*
HCFC-21	R-21	Dichlorofluoromethane	$CHFCl_2$	0.04	151	1,7
HCFC-22	R-22	Monochlorodifluoromethane	CHF_2Cl	0.055	1810	12,0
HCFC-31	R-31	Monochlorofluoromethane	CH_2FCl	0.02		
HCFC-121	R-121	Tetrachlorofluoroethane	C_2HFCl_4	0.01-0.04		
HCFC-122	R-122	Trichlorodifluoroethane	$C_2HF_2Cl_3$	0.02-0.08		
HCFC-123	R-123	Dichlorotrifluoroethane	$C_2HF_3Cl_2$	0.02-0.06	77	1,3
HCFC-124	R-124	Monochlorotetrafluoroethane	C_2HF_4Cl	0.02-0.04	609	5,8
HCFC-131	R-131	Trichlorofluoroethane	$C_2H_2FCl_3$	0.007-0.05		
HCFC-132	R-132	Dichlorodifluoroethane	$C_2H_2F_2Cl_2$	0.008-0.05		
HCFC-133	R-133	Chlorotrifluoroethane	$C_2H_2F_3Cl$	0.02-0.06		
HCFC-141	R-141	Dichlorofluoroethane	$C_2H_3FCl_2$	0.005-0.07		
HCFC-141b	R-141b	Dichlorofluoroethane	CH_3CFCl_2	0.11	725	9,3
HCFC-142	R-142	Chlorodifluoroethane	$C_2H_3F_2Cl$	0.008-0.07		
HCFC-142b	R-142b	Chlorodifluoroethane	CH_3CF_2Cl	0.065	2310	17,9
HCFC-151	R-151	Chlorofluoroethane	C_2H_4FCl	0.003-0.005		
HCFC-221	R-221	Hexachlorofluoropropane	C_3HFCl_6	0.015-0.07		
HCFC-222	R-222	Pentachlorodifluoropropane	$C_3HF_2Cl_5$	0.01-0.09		
HCFC-223	R-223	Tetrachlorotrifluoropropane	$C_3HF_3Cl_4$	0.01-0.08		
HCFC-224	R-224	Trichlorotetrafluoropropane	$C_3HF_4Cl_3$	0.01-0.09		
HCFC-225	R-225	Dichloropentafluoropropane	$C_3HF_5Cl_2$	0.02-0.07		
HCFC-225ca	R-225ca	Dichloropentafluoropropane	$CF_3CF_2CHCl_2$	0.025	122	1,9
HCFC-225cb	R-225cb	Dichloropentafluoropropane	CF_2ClCF_2CHClF	0.033	595	5,8
HCFC-226	R-226	Monochlorohexafluoropropane	C_3HF_6Cl	0.02-0.10		
HCFC-231	R-231	Pentachlorofluoropropane	$C_3H_2FCl_5$	0.05-0.09		
HCFC-232	R-232	Tetrachlorodifluoropropane	$C_3H_2F_2Cl_4$	0.008-0.10		
HCFC-233	R-233	Trichlorotrifluoropropane	$C_3H_2F_3Cl_3$	0.007-0.23		
HCFC-234	R-234	Dichlorotetrafluoropropane	$C_3H_2F_4Cl_2$	0.01-0.28		
HCFC-235	R-235	Monochloropentafluoropropane	$C_3H_2F_5Cl$	0.03-0.52		
HCFC-241	R-241	Tetrachlorofluoropropane	$C_3H_3FCl_4$	0.004-0.09		
HCFC-242	R-242	Trichlorodifluoropropane	$C_3H_3F_2Cl_3$	0.005-0.13		
HCFC-243	R-243	Dichlorotrifluoropropane	$C_3H_3F_3Cl_2$	0.007-0.12		
HCFC-244	R-244	Monochlorotetrafluoropropane	$C_3H_3F_4Cl$	0.009-0.14		
HCFC-251	R-251	Monochlorotetrafluoropropane	$C_3H_4FCl_3$	0.001-0.01		
HCFC-252	R-252	Dichlorodifluoropropane	$C_3H_4F_2Cl_2$	0.005-0.04		
HCFC-253	R-253	Monochlorotrifluoropropane	$C_3H_4F_3Cl$	0.003-0.03		
HCFC-261	R-261	Dichlorofluoropropane	$C_3H_5FCl_2$	0.002-0.02		
HCFC-262	R-262	Monochlorodifluoropropane	$C_3H_5F_2Cl$	0.002-0.02		
HCFC-271	R-271	Monochlorofluoropropane	C_3H_6FCl	0.001-0.03		

Annex IV. Refrigerant blends that contain HCFCs

*(Source: ODP and GWP values from 2006 UNEP Technical Options Committee Refrigeration, Air Conditioning and Heat Pumps Assessment Report, pp 32-34, except for items marked with *, taken from 2002 UNEP Technical Options Committee Refrigeration, Air Conditioning and Heat Pumps Assessment Report, pp 193-197 (NA = not available); ANSI/ASHRAE 34-2007, Designation and Safety Classification of Refrigerants)*

ASHRAE Code	Components	Percentage composition	ODP	GWP (100 yr)
R-401A	R-22/152a/124	53.0/13.0/34.0	0.033	1200
R-401B	R-22/152a/124	61.0/11.0/28.0	0.036	1300
R-401C	R-22/152a/124	33.0/15.0/52.0	0.027	930
R-402A	R-125/290/22	60.0/2.0/38.0	0.019	2800
R-402B	R-125/290/22	38.0/2.0/60.0	30	2400
R-403A	R-290/22/218	5.0/75.0/20.0	0.038	3100
R-403B	R-290/22/218	5.0/56.0/39.0	0.028	4500
R-405A	R-22/152a/142b/	45.0/7.0/5.5/42.5	0.026	5300
R-406A	R-22/600a/142b	55.0/4.0/41.0	0.056	1900
R-408A	R-125/143a/22	7.0/46.0/47.0	0.024	3200
R-409A	R-22/124/142b	60.0/25.0/15.0	0.046	1600
R-409B	R-22/124/142b	65.0/25.0/10.0	0.045	1600
R-411A	R-1270/22/152a	1.5/87.5/11.0	0.044	1600
R-411B	R-1270/22/152a	3.0/94.0/3.0	0.047	1700
	R-1270/22/152a	3.0/95.5/1.5	0.032*	1600*
R-412A	R-22/218/142b	70.0/5.0/25.0	0.053	2300
R-414A	R-22/124/600a/142b	51.0/28.5/4.0/16.5	0.043	1500
R-414B	R-22/124/600a/142b	50.0/39.0/1.5/9.5	0.039	1400
R-415A	R-22/152a	82.0/18.0	0.041	1500
R-415B	R-22/152a	25.0/75.0	0.013	550
	R-22/152a	52.0/48.0	0.018*	940*
	R-22/152a	60.0/40.0	0.020*	1100*
R-416A	R-134a/124/600	59.0/39.5/1.5	0.008	1100
R-418A	R-290/22/152a	1.5/96.0/2.5	0.048	1700
R-420A	R-134a/142b	88.0/12.0	0.008	1500
R-501 *	R-22/12	75.0/25.0	NA	NA
R-502	R-22/115	48.8/51.2	0.250	4700
R-505	R-12/31	78.0/22.0	NA	NA
R-506	R-31/114	55.1/44.9	NA	NA
R-509A	R-22/218	44.0/56.0	0.022	5700

Annex V. Brief review of regulations concerning HCFC containing equipment

The main applications of HCFCs have traditionally been RAC, foams, solvents, aerosols and fire extinguishing. A brief description of the regulations in place is given below:

Refrigeration and Air Conditioning

a) HCFC Use Controls, New Equipment

This means there has been a ban on the use of HCFCs in the manufacture of new equipment for the following applications (Regulation *(EC)* 2037/2000):

- non-confined direct evaporation systems
- domestic refrigerators and freezers
- motor vehicle, tractor and off-road vehicle or trailer air conditioning systems
- road public-transport air-conditioning
- rail transport air conditioning applications
- public and distribution cold stores and warehouses
- equipment of 150 kW and over shaft input

Regulation (EC) № 2037/2000 had introduced further use controls: The use of HCFCs had been banned for the manufacture of new equipment in all refrigeration and air-conditioning applications from 1st January 2001 except for 2 temporary exemptions:

- The ban had been delayed until 1st July 2002 for fixed air-conditioning;
- Equipment with a cooling capacity of less than 100 kW.
- The ban had been delayed until 1st January 2004 for reversible air-conditioning/ heat pump systems.

b) HCFC controls: imports & exports:

- Imports of HCFCs subject to limits – all imports are licensed by Commission
- Imports of products and equipment containing HCFCs prohibited - unless produced before use ban

- HCFC exports permitted (except non-Party states)
- All export are authorised by Commission
- Exports of HCFC equipment and products permitted (but use of HCFCs banned for such exports on 31 Dec 2009)

c) HCFC Use Controls, Existing Equipment

New controls had been introduced related to the use of HCFCs in the maintenance of RAC systems manufactured prior to the relevant manufacture ban. There will be a ban on the use of virgin HCFCs from 1st January 2010 and a ban on the use of all HCFCs, including recycled materials, from 1st January 2015.

d) Leakage Prevention

The new EC Regulation strengthens requirements for the prevention of leakage of ODS refrigerants from systems. It requires maintaining a comprehensive data reporting by producers, importers, exporters and users of refrigerants in the EU.

All precautionary measures practicable must be taken in order to prevent and minimize leakage. Recovered HCFC has to be recycled or properly destroyed.

An important new rule is that fixed equipment containing ODS, which has a refrigerating fluid charge greater than 3 kg must be checked at least annually for leakage, with more frequent checks in larger systems (half-yearly or quarterly). It is obligatory to keep a log of all maintenance and service records as well as the origin of the refrigerant used for charging the equipment.

To ensure that recovery and leakage issues are properly dealt with by refrigeration technicians the Regulation calls for each Member State to set a ***minimum qualification level*** for all personnel servicing and maintaining equipment and handling refrigerants.

e) F-Gases Regulation and MAC Directive

- One proposal but two elements, both entered into force 4.07.2006
- Regulation (EC) 842/2006 for containment and recovery, use bans and prohibitions – applies from 4.07.2007
- Directive 2006/40/EC for phase out of HFCs > 150 GWP in mobile air-conditioning systems in motor vehicles – applies from 5.01.2008

Foams

a) Use Controls - HCFCs

Regulation (EC) № 2037/2000 had introduced a series of product related bans that lead to the **complete phase out the use of HCFCs in foam blowing by 1st January 2004**.

The key steps in the phase out schedule were:

- From 1st October 2000 a ban on HCFCs for production of polyethylene rigid insulating foams and all integral skin foams for use in safety applications.
- From 1st January 2002 a ban on HCFCs for production of extruded polystyrene rigid insulating foams (except where used for insulated transport).
- From 1st January 2003 a ban on HCFCs for production of polyurethane foams for appliances, polyurethane flexible faced laminate foams and polyurethane sandwich panels (except where the latter two are used for insulated transport).
- From 1st January 2004 no foams could be manufactured using HCFCs.

b) Recovery & Destruction

The EC Regulations calls for recovery of ODS from foams “if practicable”. The recovered fluid must be destroyed or re-used (although, in most situations other aspects of the new EC Regulation would prevent re-use).

Solvents

Use of HCFCs in non-contained solvent uses is prohibited. Since 01 January 2002 there is a ban on the use of HCFCs in all solvent applications. There was a temporary exemption for precision cleaning of electrical and other components in aerospace and aeronautics applications where the use ban has enter into force on 31st December 2008.

With immediate effect all ozone depleting solvents ***must*** be recovered during servicing and maintenance of equipment or prior to dismantling or disposal of equipment. With the exception of HCFCs, all recovered ODS solvents must be

destroyed by an environmentally acceptable technology. HCFCs can be recovered for re-use in applications where this is permitted by the Regulation.

Aerosols

Use of CFCs in the production of aerosols is prohibited from 1st October 2000, and use of HCFCs as an aerosol propellant has been banned since 2002.

Fire protection systems

All halons and other ODS contained in fire protection systems and fire extinguishers must be recovered during servicing and maintenance of equipment or prior to dismantling or disposal of equipment. Recovery must be for destruction by an environmentally acceptable technology. The only exemption to this rule is for reuse in the “critical uses” listed in Annex VII of Regulation (EC) No 2037/ 2000 (Replaced by Annex VI of Regulation (EC) No 1005/ 2009).

Destruction of used controlled substances

For destruction of controlled substances, only approved technologies shall be applied. There are no HCFC destruction facilities in Bulgaria, which means that the entire quantity should be exported to be destroyed in other countries, which will incur significant costs for the owners.

Annex VI. General Background on Developing Refrigerant Management/ Replacement Plans

A comprehensive systems assessment must be made, including equipment inventory; operating and maintenance practices; refrigerant recovery, recycling, and reclamation procedures; refrigerant containment; and installations retrofit or replacement plans. Based on current refrigerant inventory, the company must assess recent refrigerant requirements and potential impact of regulations and legislation. This would also help to determine viable management options and propose relevant course of action. The plan would also require development of budget and replacement schedule.

For existing systems in good condition, continued use of HCFCs may be a viable short-term solution. Expenditures must be made to ensure refrigerant containment and prudent procurement and inventory practices. Leak tests, if conducted and documented properly, will help to ensure that problems are discovered and repaired quickly, minimizing refrigerant loss. An accurate leak test log will ensure compliance with Regulation 842/2006 at acceptable cost, and Proper operation and maintenance practices will help to improve overall system performance and provide efficient, reliable operation and reduce refrigerant loss.

If equipment is to be converted, its condition, service needs, and performance must be considered. Machines with serious internal service problems are appropriate retrofit candidates, and ones with major vessel or tube problems may not be. A report showing the machine's forecasted operating performance using the alternative refrigerant should be developed. The retrofit should include any options for optimizing the efficiency through modifications and re-design. Retrofit should be scheduled during regular overhauls to reduce downtime and associated costs. The plan should also include an appropriate safety policy to minimize hazards related to the physical and chemical characteristics of the new refrigerant (toxicity, flammability, pressure, and temperature parameters).

Based on the assessments described above, a schedule of dates and budget has to be developed.

A typical schedule should include the following basic steps:

- Designate a project team and a project manager;
- Train manager and team (esp. technicians);
- Perform systems assessment and evaluate available alternatives;
- Formulate refrigerant management plan;
- Implement refrigerant policy;
- Initiate/ update/ improve recordkeeping system;
- Analyze the results and implement improvements.

An aggressive, not reactive policy is necessary to meet the environmental challenges of the HCFC phase-out. Making prudent capital investment decisions and meeting short-term demands, while maintaining equipment and refrigerant assets, should be of vital concern to any plant.

For large refrigeration operators/owners, running multiple or complicated installations, it would make sense to appoint a manager whose primary role should be to ensure compliance with HCFC phase out and F-gas regulations, with principal duties including coordination of refrigerant purchases and maintaining records; gathering and disseminating information on refrigerant technology, codes, and regulations and ensuring regulatory compliance; development and implementation of refrigerant policy and administrative controls; performing systems assessment and evaluation of alternatives, planning for future refrigerant and equipment needs.

For smaller companies for which it is not economically feasible to have an employee working exclusively on these tasks, the duties should be performed by a technical manager or a technologist.

For service companies, basic refrigerant management policy should clearly show the company's intention to comply with all regulations, and should include issues such as:

- Recovery and recycling equipment should be made available to service technicians in sufficient quantity and incentives provided to ensure their use.
- Responsibility for the care and maintenance of recovery and recycling equipment, including recordkeeping, rests with the service technician.
- Records should be kept to guarantee performance and ensure regulation compliance. Included are inventory cards attached to new drums of refrigerant, use records for recycling and recovery equipment, and records on disposition of recovered or recycled refrigerant.
- Refrigerant cylinders stored on-site will not be filled to more than 80% of fluid capacity.
- Refrigerants should not be mixed. A separate, clean, evacuated, labeled vessel will be provided for each refrigerant.
- Leak testing should be performed periodically to ensure the integrity of all systems.
- Leaks should be repaired and reported upon discovery. Installation operator/owner should be notified of any substantial venting or if there is inability to repair leaks immediately.
- Refrigerants should be recovered, reclaimed, or properly destroyed whenever removed from equipment.
- Before refrigerant is recovered, recycling or reclamation requirements shall be determined.

Only approved containment vessels and equipment will be used.

Annex VII. Summary Tables

Region	*Refr. Users*		*Ind. Regrigeration*		*Air Conditioning*		*Refr. Transport*		*WHHP*	
	HCFC	*HFC*	*HCFC*	*HFC*	*HCFC*	*HFC*	*HCFC*	*HFC*	*HCFC*	*HFC*
Blagoevgrad	1 094	3 267	187	0	1 135	2 325	0	0	0	0
Burgas	3 174	1 046	167	142	709	1 819	0	0	0	0
Haskovo	1 357	4 425	106	0	353	544	0	0	0	0
Montana	544	1 744			180	10	0	0	0	0
Pazardjik	938	3 137			41	80	0	0	0	0
Pernik	816	2 696			56	1 711	0	0	0	0
Pleven	2 337	8 923	82	3	1 547	2 428	0	0	0	0
Plovdiv	1 499	2 496	0	26	719	485	170	130	0	0
Russe	4 726	0			670	0	0	0	0	0
Shumen	530	5 517			342	413	0	0	0	0
Smolyan	641	243	33	44	85	90	0	24	0	0
Sofia	1 350	2 659	190	443	1 206	972	17	82	0	0
Stara Zagora	2 586	3 459			62	73	0	0	0	0
Veliko Tarnovo	3 328	6 586	301	344	587	1 113	0	0	0	112
Varna	2 273	5 216			7 086	9 092	0	0	0	0
Vratza	843	2 361			2 344	519	0	0	0	0
	28 036	**53 775**	**1 066**	**1 002**	**17 122**	**21 674**	**187**	**236**	**0**	**112**

Total Reported HCFC Banks: ***46 411 kg.***

Total Reported HFC Banks: ***76 799 kg.***