



# BOSNIA AND HERZEGOVINA

Ministry of Foreign Trade and Economic Relations

National Ozone Unit of Bosnia and Herzegovina



**SURVEY ON ODS ALTERNATIVES IN BOSNIA AND HERZEGOVINA-RAC Sector  
Kigali Amendment- Vienna Talks, 13-15 June 2017,  
Vienna, Austria**

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## ODS alternatives in BiH in the period 2012-2015.

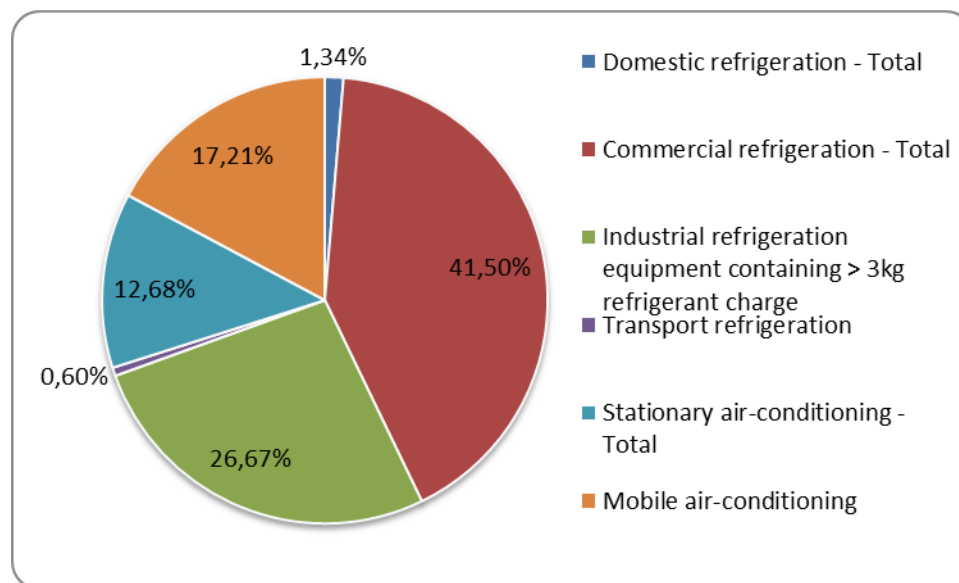
- The demand of the **domestic refrigeration sector** is met by HFC-134a, R-600/600a and CFC-12.
- In the **commercial refrigeration sector** the highest demand is for R-404a, followed by HFC-134a and then R-410a, HCFC-22, R-11 and R-407c.
- The demand of the **industrial refrigeration** sector is associated with the consumption HFC-134a, followed by R-404a, R-406a, R-22, R-11, R-407c, R-410a, R-717, R-744 and R-600a.
- In the **transport refrigeration** sector, the demand is for R-404a, R507a and HFC-134a.
- In the **stationary air-conditioning** sector the consumption is associated with use of R-410a, R-407c, R-22, R-404a and HFC-134a.
- **MAC sector** is entirely driven by HFC 134-a and to a small extent HFO 1234 yf.

## ***Total Consumption of ODS Alternatives in 2015 – RAC Sector***

**Commercial refrigeration has the largest consumption** in RAC sector with a share of 41.50%, followed by **industrial refrigeration systems** (refrigeration equipment containing > 3kg refrigerant charge) with 26.67%.

**Mobile air-conditioning** accounts for the share of consumption of 17.21% and **stationary air –conditioning** 12.68%.

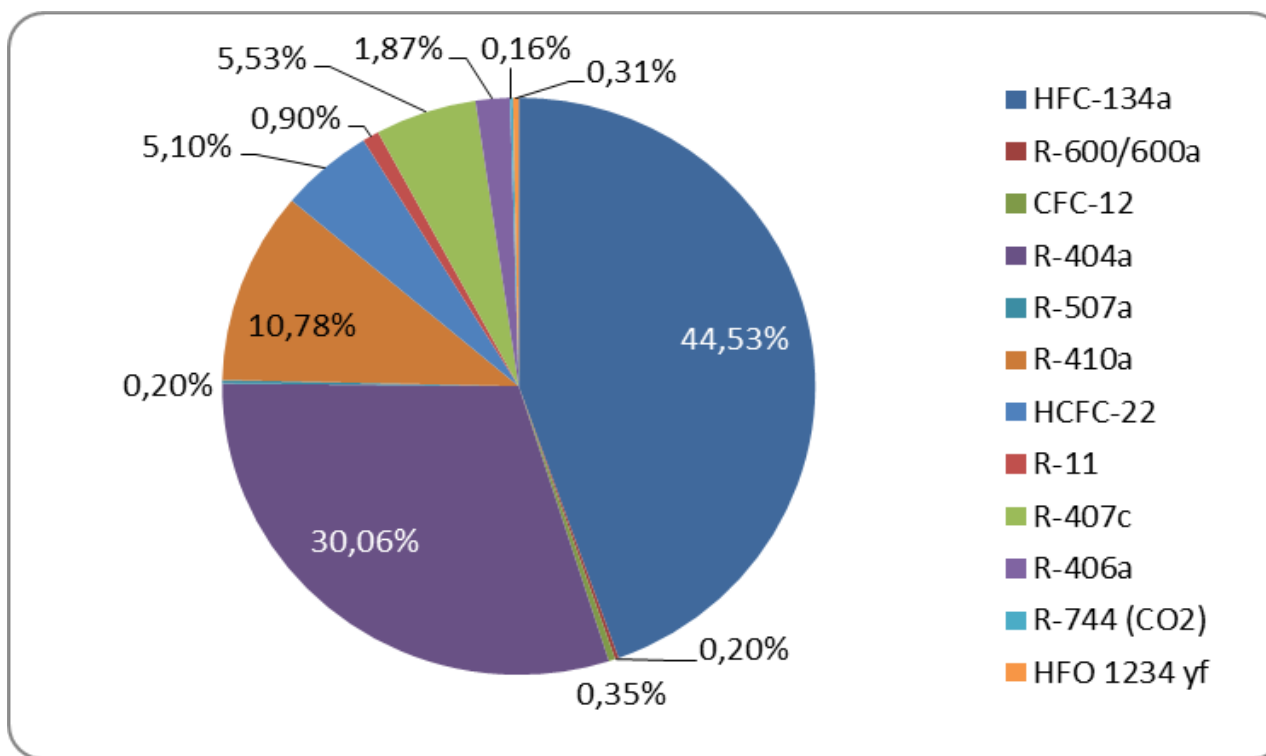
A detailed overview of the bank and service needs in 2015 in RAC sector is presented in Table 68 of the Survey.



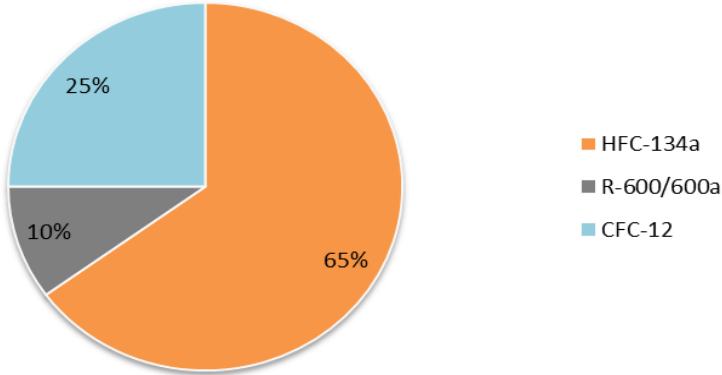
## Consumption by ODS Alternative in 2015 – RAC Sector

In RAC sector the highest demand is associated with consumption of HFC-134a (44.53%) and R-404a (30.06%).

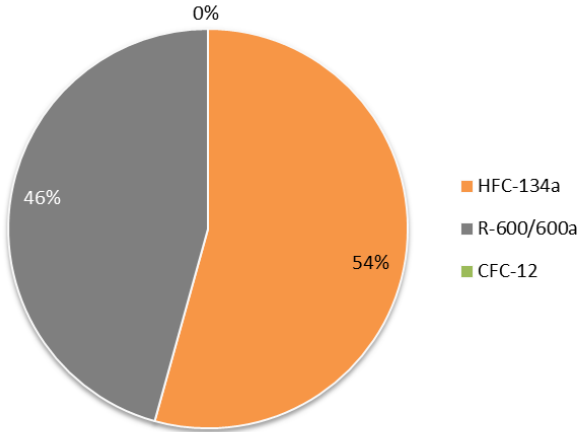
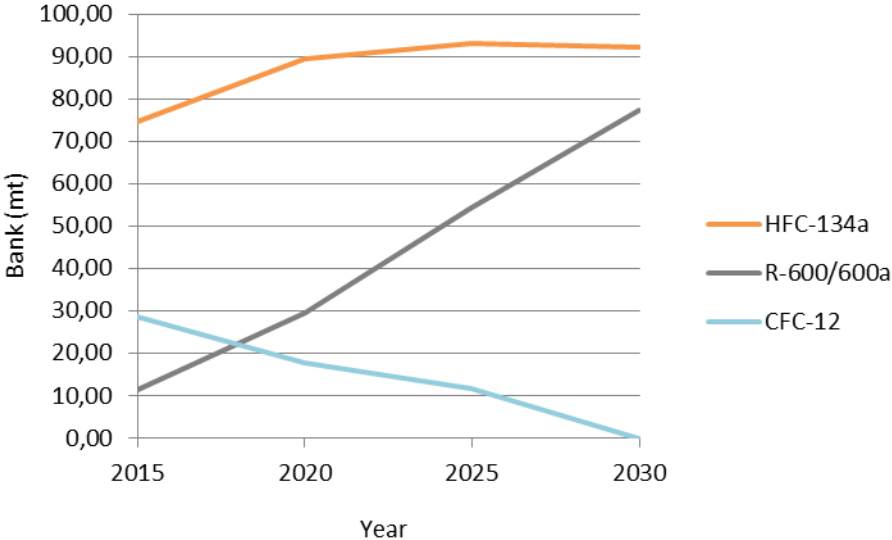
The servicing needs of HFC-134a and R-404a in this sector are 105.27 mt and 71.07 mt, respectively

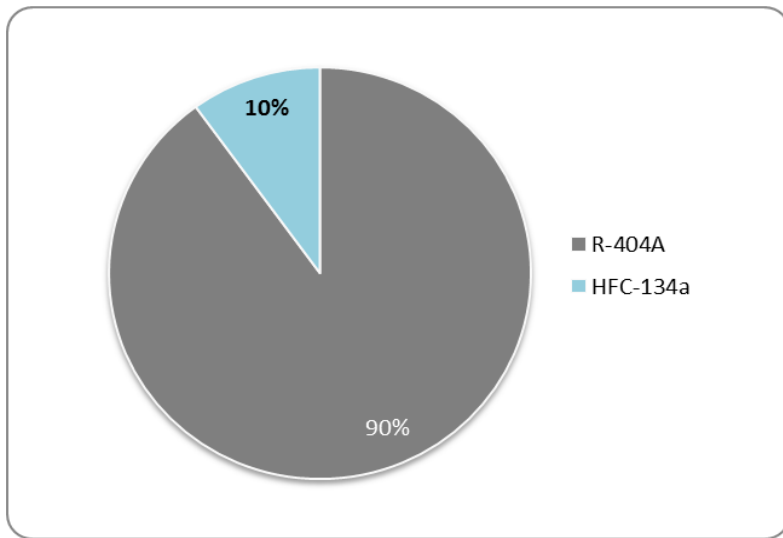


### Distribution of Refrigerants in Refrigerators in 2015



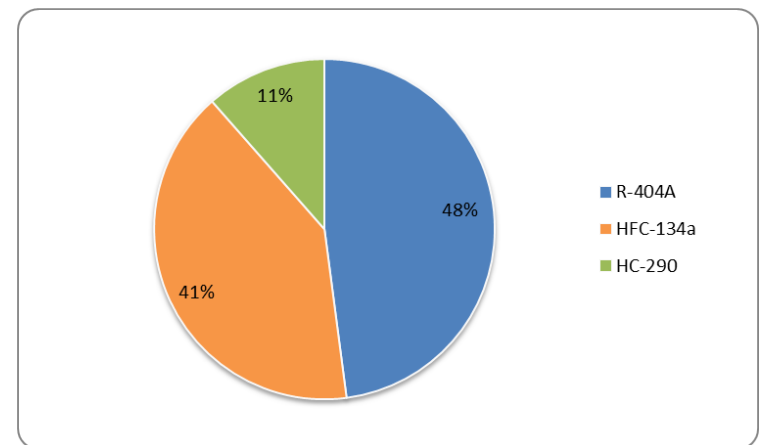
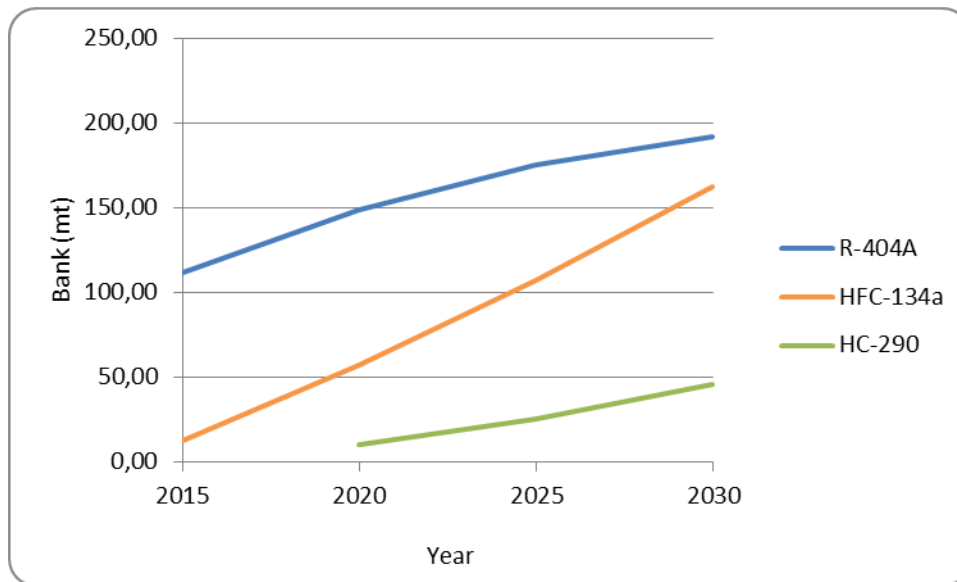
### Growth Forecast of Refrigerant Consumption in Refrigerators for the period 2016-2030 and Estimation of Distribution of Refrigerants in Refrigerators in 2030



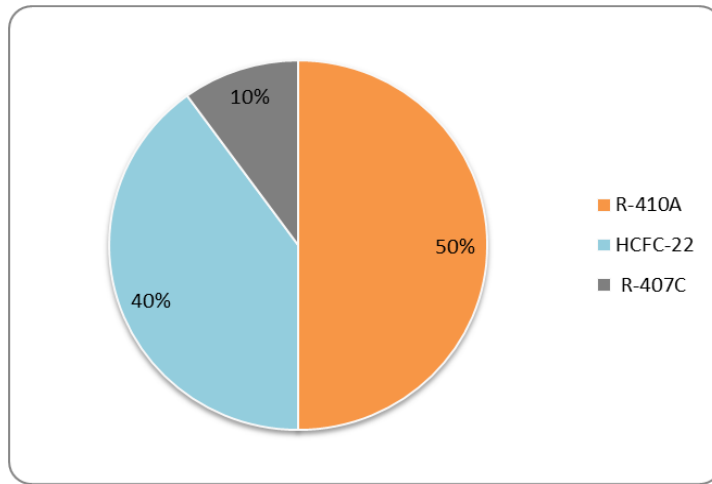


*Distribution of Refrigerants in Commercial Refrigeration Equipment Containing Less than 3 kg of Refrigerant Charge in 2015*

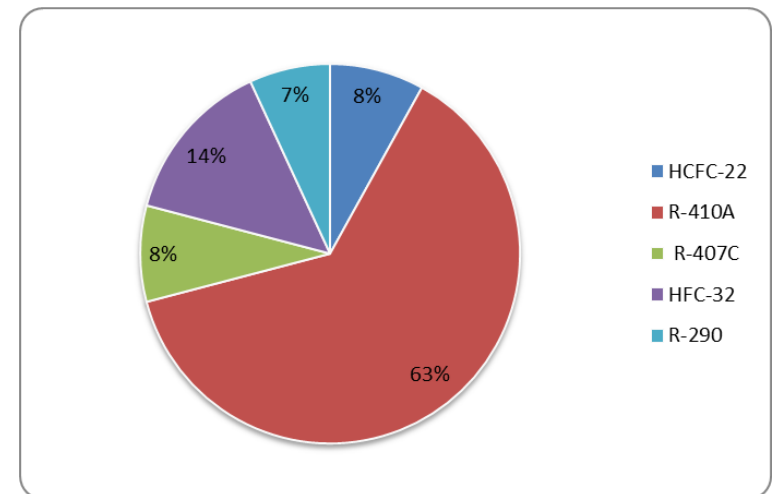
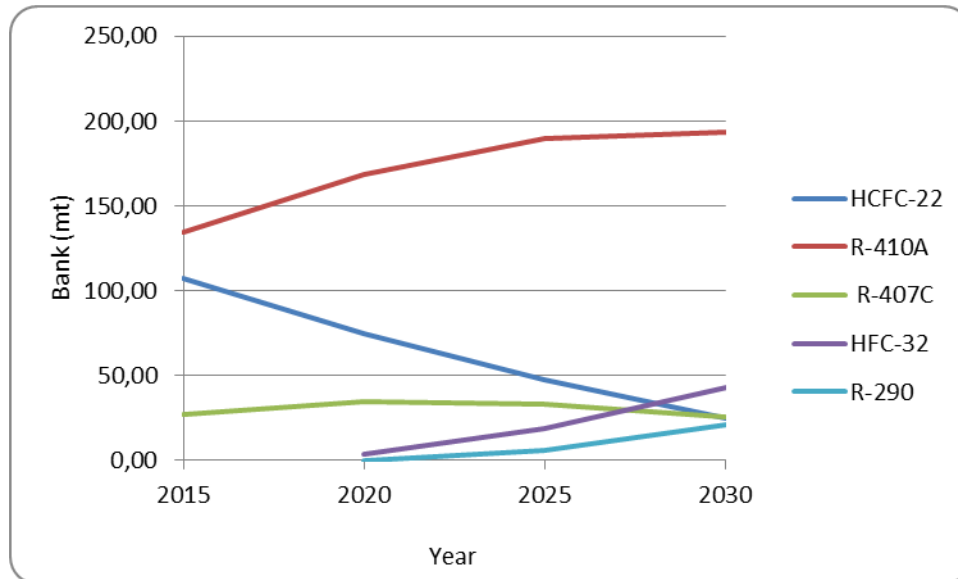
*Growth Forecast of Consumption of Refrigerants in Commercial Refrigeration Equipment Containing Less Than 3 kg of Refrigerant Charge in the period 2016-2030  
Estimation of Distribution of Refrigerants in Commercial Refrigeration Equipment Containing Less Than 3 kg of Refrigerant Charge in 2030*



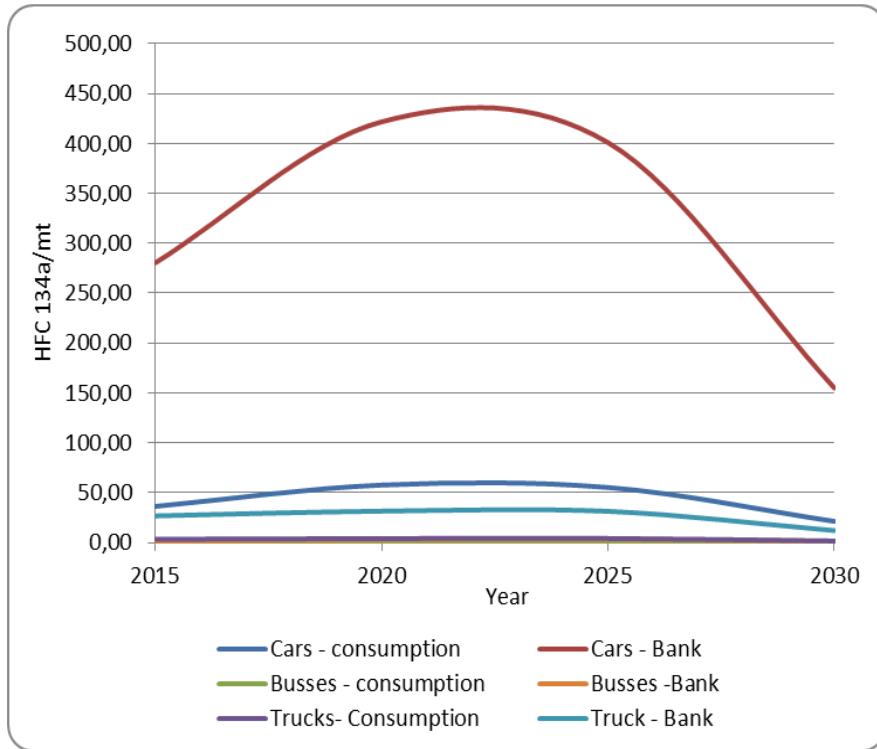
## Distribution of Refrigerants in Room Domestic/Commercial Air-conditioning in 2015



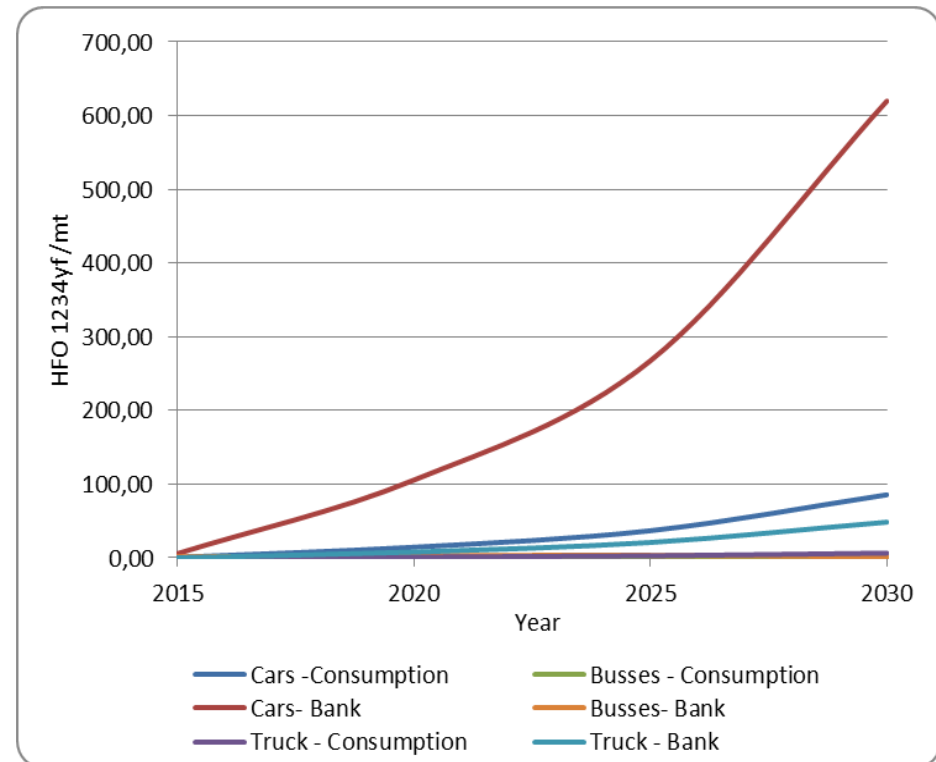
### Growth Forecast of Consumption of Refrigerants in Air-conditioning Equipment Containing Less Than 3 kg of Refrigerant Charge in the period 2016-2030 Estimation of Distribution of Refrigerants in Air-conditioning Equipment Containing Less Than 3 kg of Refrigerant Charge in 2030



## Estimated Trend of HFC 134a Consumption and Bank in MAC Sector in the Period 2015 - 2030



## Estimated Trend of HFO 1234yf Consumption and Bank in MAC Sector in the Period 2015 - 2030





## Summary of Bank and Service Needs in 2015 – Refrigeration and Air-conditioning Sector (in mt)

Sector		HFC-134a	R-600/600a	CFC-12	R-404a	R-507a	R-410a	HCFC-22	R-11	R-407c	R-406a	R-744 (CO2)	HFO 1234 yf	Total
Domestic refrigeration - Total	Bank	98.58	18.00	41.75										158.34
	Servicing needs	1.97	0.36	0.84										3.17
Refrigerators	Bank	74.75	11.50	28.75										115.00
	Servicing needs	1.49	0.23	0.57										2.30
Freezers	Bank	23.84	6.50	13.00										43.34
	Servicing needs	0.48	0.13	0.26										0.87
Commercial refrigeration - Total	Bank	149.93			268.65		47.03	14.24	14.24	25.54				519.63
	Servicing needs	29.48			50.83		8.58	2.14	2.14	4.94				98.10
Equipment containing < 3kg refrigerant charge	Bank	12.40			111.60									124.00
	Servicing needs	1.86			16.74									18.60
Equipment containing > 3kg refrigerant charge	Bank*	137.53			157.05		47.03	14.24	14.24	25.54				395.63
	Servicing needs*	20.63			23.56		7.06	2.14	2.14	3.83				59.34
Manufacturing of commercial refrigeration equipment	Bank													
	Manufacturing needs	6.99			10.53		1.52			1.11				20.16
Industrial refrigeration equipment containing > 3kg refrigerant charge	Bank*	221.81	0.77		130.06		2.81	29.51		3.43	29.44	2.47		2419.34
	Servicing needs*	33.27	0.12		19.51		0.42	4.43		0.52	4.42	0.37		362.90
Transport refrigeration	Bank	2.89			3.55	3.14								9.58
	Servicing needs	0.43			0.53	0.47								1.43
Stationary air-conditioning - Total	Bank	1.11			1.34		199.20	108.17		68.69				378.51
	Servicing needs	0.17			0.20		16.48	5.51		7.62				29.98
Room domestic/commercial air-conditioning	Bank						134.00	107.20		26.80				268.00
	Servicing needs						6.70	5.36		1.34				13.40
Air-conditioning equipment containing > 3kg refrigerant charge	Bank*	1.11			1.34		65.20	0.97		41.89				110.51
	Servicing needs*	0.17			0.20		9.78	0.15		6.28				16.58
Mobile air-conditioning	Bank	308.73											5.72	314.45
	Servicing needs	39.95											0.74	40.69
Total	Bank	783.05	18.77	41.75	403.60	3.14	249.04	151.92	14.24	97.67	29.44	2.47	5.72	
	Servicing needs	105.27	0.48	0.84	71.07	0.47	25.48	12.07	2.14	13.08	4.42	0.37	0.74	

# Estimated Use by ODS Alternative

\* Calculation based on estimated bank of refrigerants and servicing needs

Alternative	Estimated use (mt)				
	2012	2013	2014	2015	2015*
<b>HFC*</b>					
HFC-134a	129.15	74.99	94.95	100.83	111.47
Others (HFC-227ea)	0.32	0.03	0.03	1.70	
Others (HFA 134a/Ethanol)	0.30	0.30	0.40	0.50	0.50
<b>HFC blends</b>					
R-404A	44.04	57.32	49.70	71.00	71.07
R-407C	8.55	10.17	6.78	11.60	13.08
R-410A	12.70	21.41	13.67	23.80	25.48
R-507A	0.23	0.23	0.00	0.57	0,47
<b>HFO</b>					
HFO-1234yf	0.33	0.42	0.60	0.74	0.74

*Forecast of Use of Refrigerants with Low Global Warming Potential (GWP) in BiH*

Sector	Application	Forecast of consumption of alternatives with low GWP
Domestic refrigeration	Household and commercial use	HC-600a
Commercial refrigeration	Commercial use	HC-290
Stationary air-conditioning	Household and commercial use	HC-290, HFC-32
Mobile air-conditioning	Transport	HFO 1234 yf

This survey on ODS alternatives has given opportunity to BiH to review the situation with ODS alternatives consumption in the country and to try to make predictions for their consumption in the next fifteen years. This report can be considered as a good base for further planning.

- **Introduce registration system and equipment records**, and introduce **legal obligation for equipment owners** to register and submit periodic reports to the competent authorities. This eventually includes installation of software covering certification of service technicians and records of the equipment owners and equipment itself;
- Develop comprehensive and detailed ODS alternatives bank. This survey report contains estimated data on ODS alternatives bank in 2015 as well as predictions on the bank for years 2020, 2025 and 2030.
- In order to make a much clearer picture of the presence of the equipment containing alternatives to ODS substances in the country, a **deeper analysis and inventory** should be made;

- Develop and implement **proper training leading to improvement and increasing of the energy efficiency in refrigeration technology**. As the first step it would be necessary to organize training of trainers in order to carry out training of the service technicians. It is also important to continuously develop the two established training centres in Mechanical Faculties of Sarajevo and Banja Luka;
- **Include natural refrigerants (HC, Ammonia, CO<sub>2</sub>) in regular training programme of service technicians.**
- **Given that in BiH there is industry (breweries, dairy industry, etc.) which uses ammonia installations, there is a sound ground to conduct these trainings.**
- **The trainings should, inter alia, cover the alternatives to ODS substances and their characteristics, areas of application, energy efficiency of these systems, as well as benefits and barriers of introducing them.**
- **It would also be useful to consider training on installations with R-744 (CO<sub>2</sub>) as refrigerant;**
- So far, public awareness activities have been a continuous task of the NOU BiH; however, there's a need to continue and improve the awareness programmes/activities by specifically **addressing technically related issues.**