Greenhouse gas Inventory Office of Japan

WG2 "Non-CO_2 Gases"

➢*Presentation*

"Emission-Trend, Methodology and Mitigation-Measures of HFCs, PFC and SF_6 in JAPAN"

14 July 2011, Phnom Penh, CAMBODIA
The 9th Workshop on GHG Inventories in Asia

Keizo Hirai
Greenhouse Gas Inventory Office of Japan (GIO)
National Institute for Environmental Studies (NIES)

"Montreal Protocol"

Halocarbons	Abbreviated Name	ODP, Ozone Depletion Potential	GWP	Abolition Due-Date for Developed Countries	Abolition Due-Date for Developing Countries
CFC, Chloro Fluoro Carbon	11	1.0	3,800	Before 1996	Before 2010
	12	1.0	8,100		
	113	0.8	4,800		
	114	1.0	–		
	115	0.6	–		
Halon, Alkyl Halide with Br	1211	3.0	–	Before 1994	Before 2010
	1301	10	5,400		
	2402	6.0	–		
Bromomethane	–	0.60	–	Before 2005	Before 2015
HCFC, Hydro Chloro Fluoro Carbon	22	0.055	1,500	Before 2020	After 2030
	142b	0.065	1,800		
	123	0.020	90		
	124	0.022	470		
	141b	0.11	–		
	225ca	0.025	–		
	225cb	0.033	–		

Reference: "UN Environment Programme", "White Paper on Environment by Japanese Ministry of Environment", "Second Assessment Report by IPCC"

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Green House Gases

Green House Gas		GWP
SF_6		23,900
PFC-14 (CF_4)		6,500
PFC-116(C_2F_6)		9,200
HFCs, Hydro Fluoro Carbon	23	11,700
	32	650
	125	2,800
	134a	1,300
	143a	3,800
	152a	140
	227ea	2,900
	236fa	6,300
	43-10mee	1300

Methodology for HFCs

Tier 1=Potential or Basic

Tier 1 a: Emission=Produced + Imported-Exported in bulk
Tier 1 b: Imported = Imported in bulk + Quantity in imported products which contains HFCs
Exported= Exported in bulk + Quantity in exported products which contains HFCs

Tier 2=Actual Emission=Σ (1),(2) and (3)

(1)Emissions during system manufacture/assembly in year
(2)Emissions during system operation in year
(3)Emissions at system disposal in year

Reference: "Second Assessment Report by IPCC", "IPCC-Guide Line"

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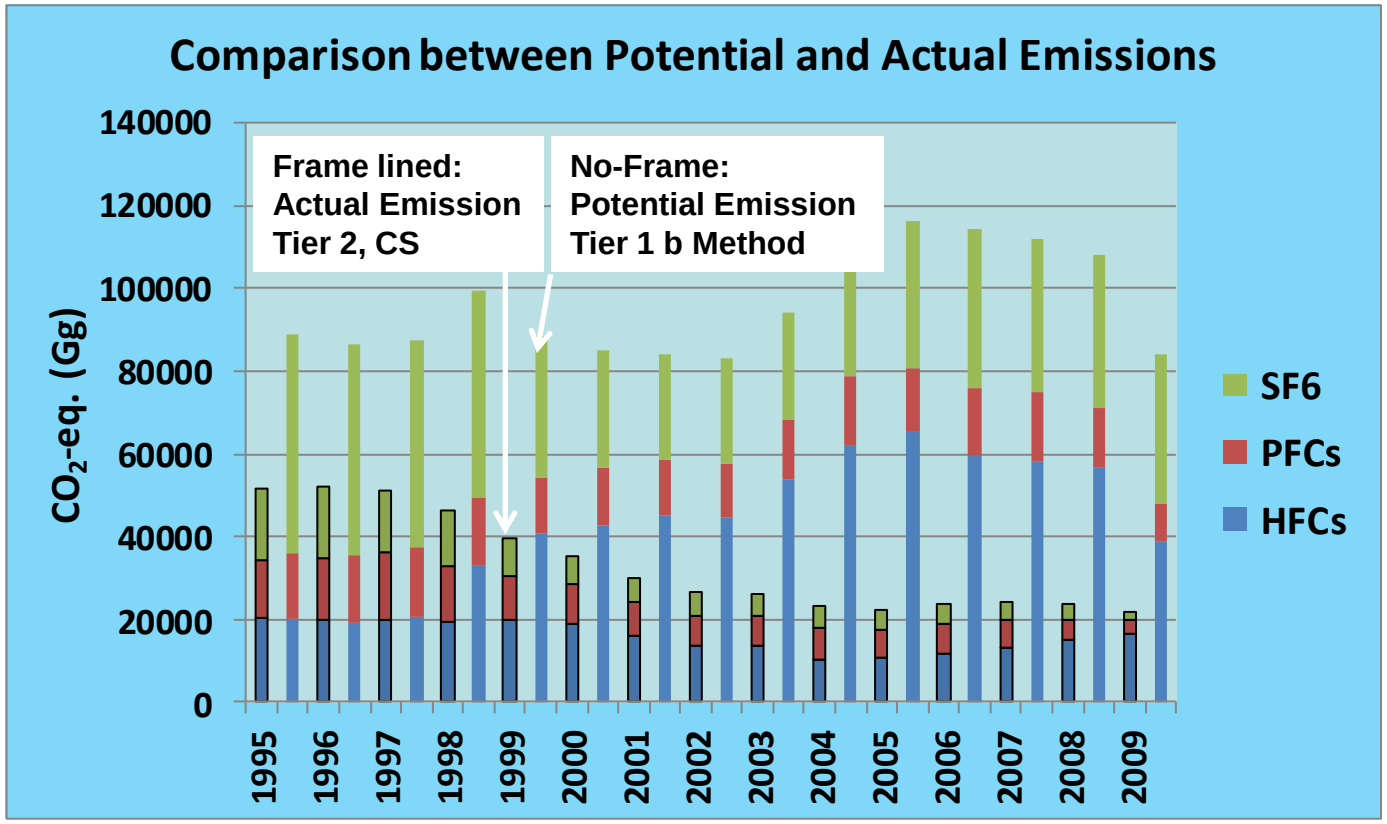

The potential method is likely to overstate emissions.

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

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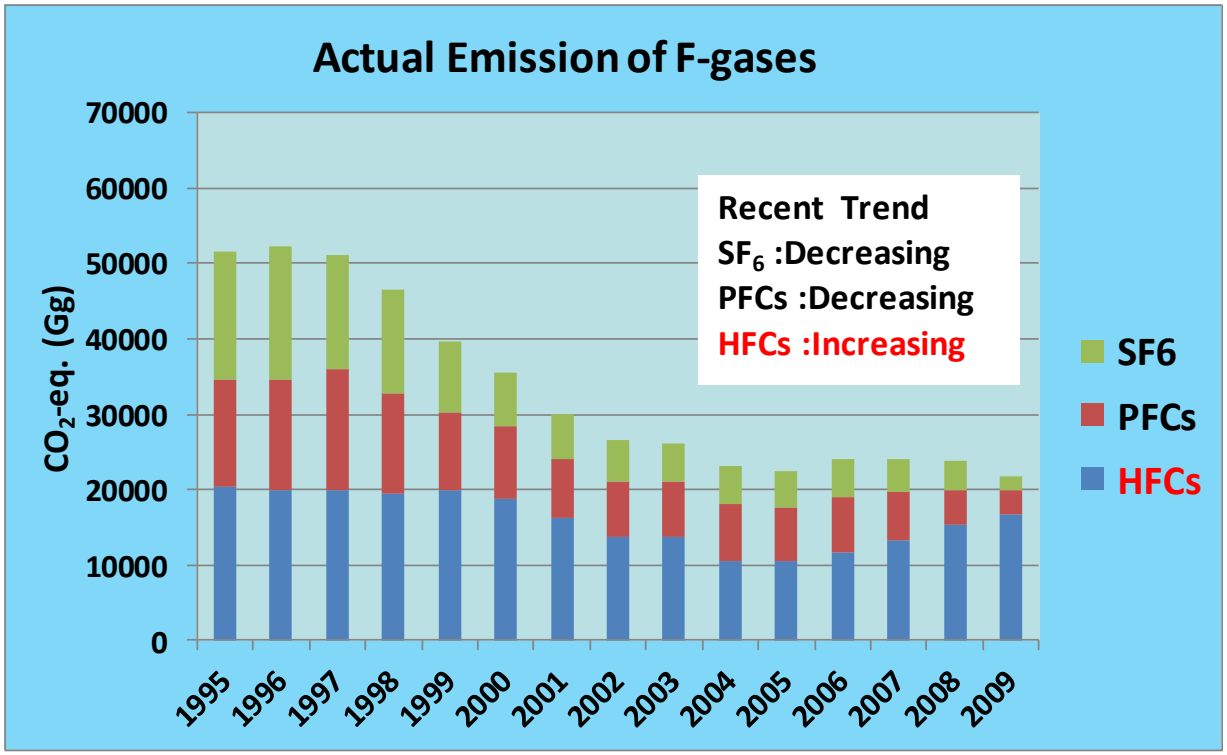

HFCs is the most concerned F-gas for JAPAN

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

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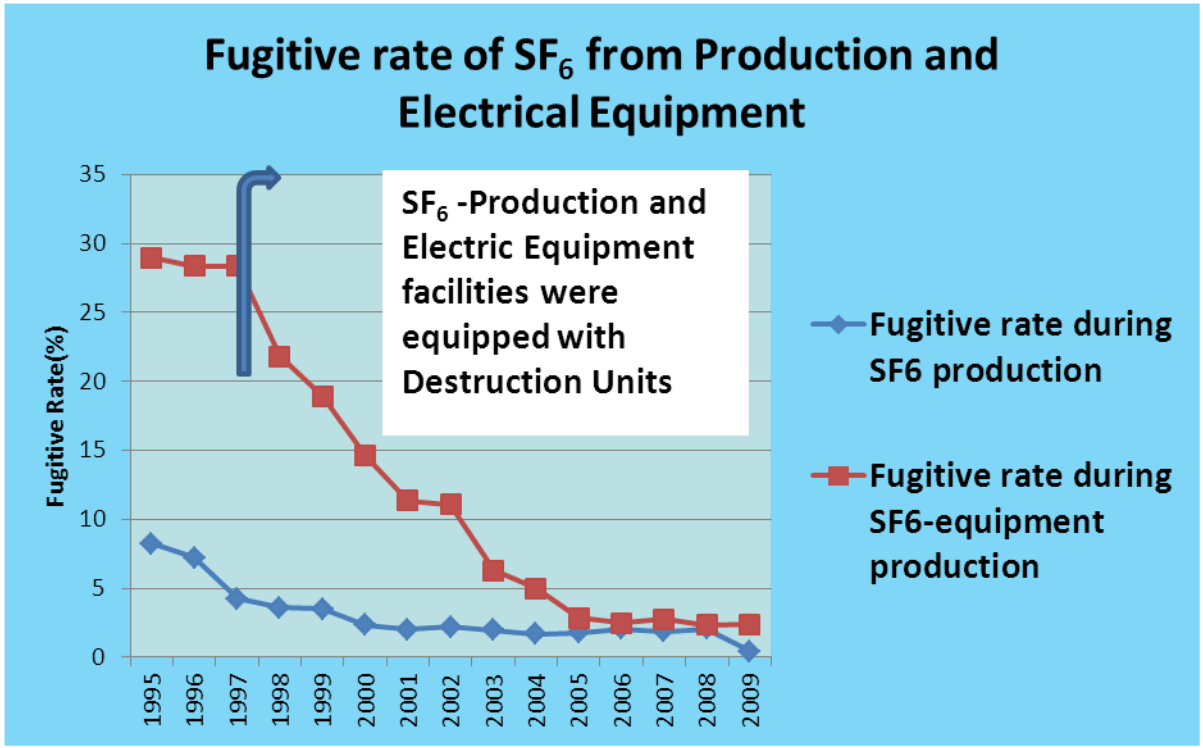

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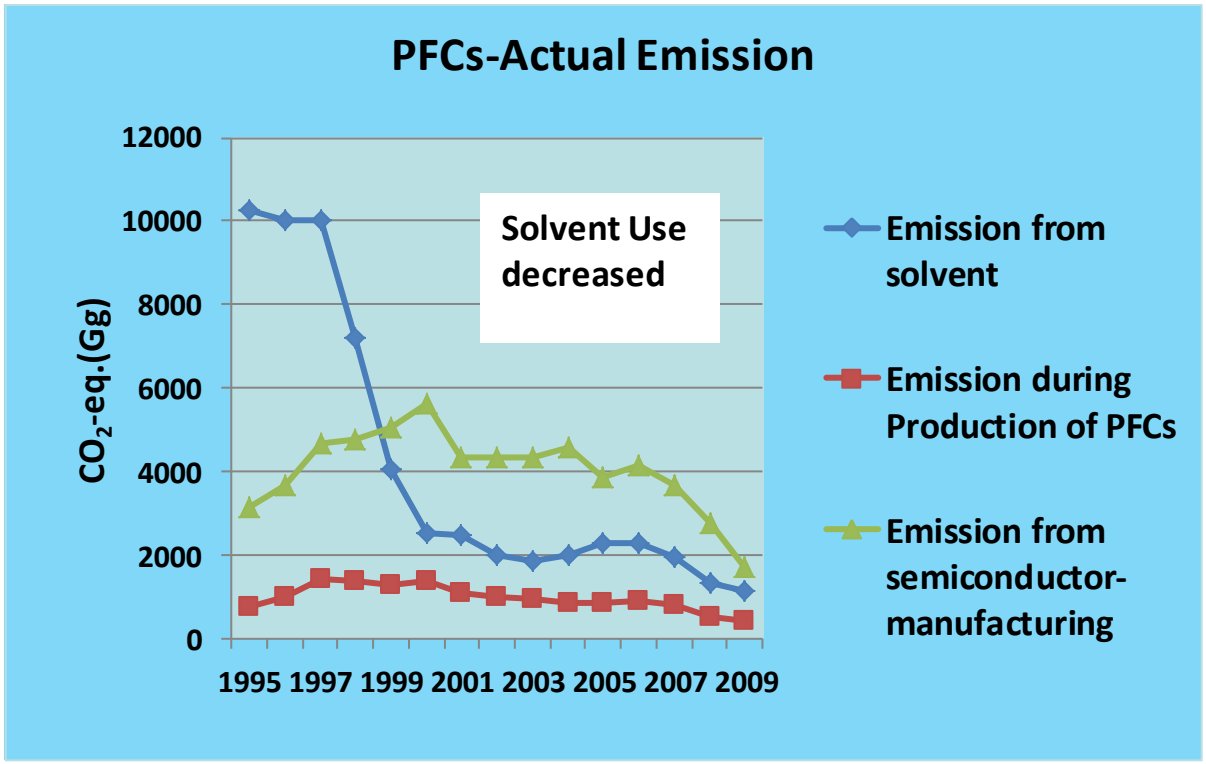

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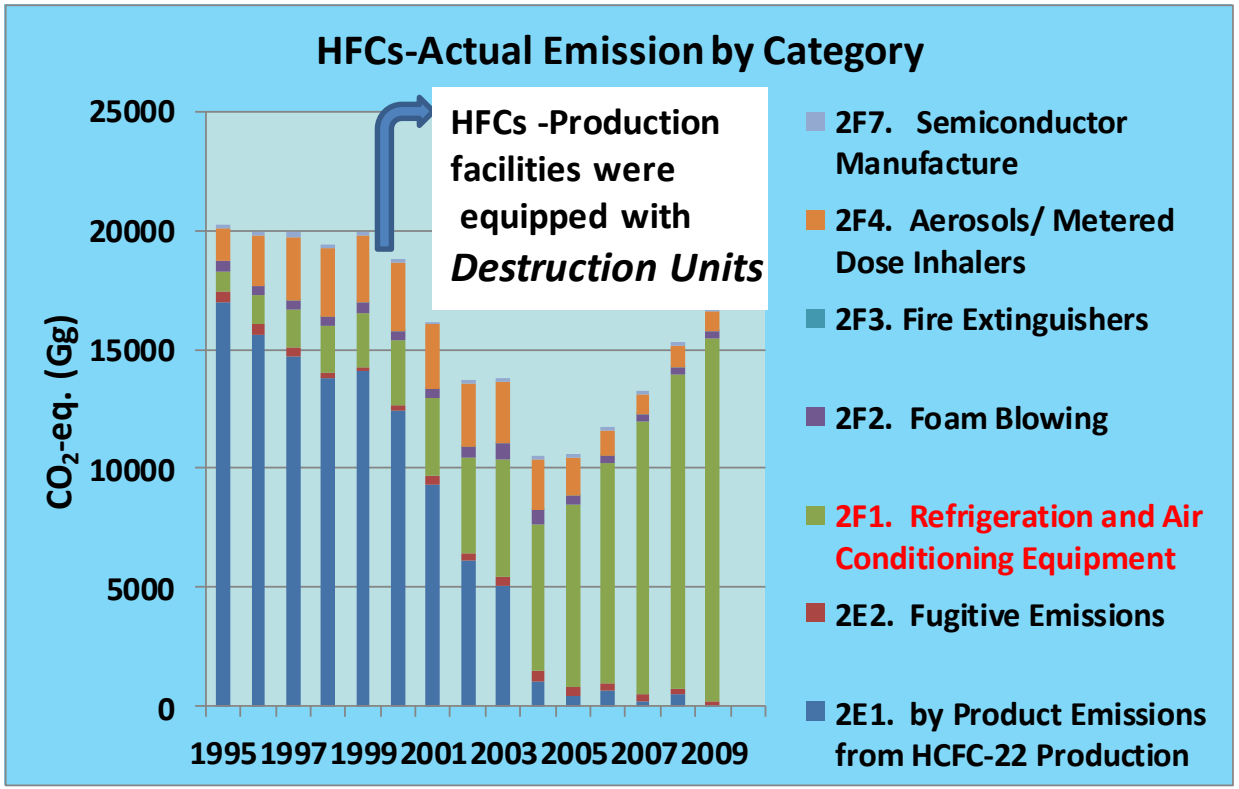

"Refrigeration and Air-Conditioning" is the most concerned Category

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

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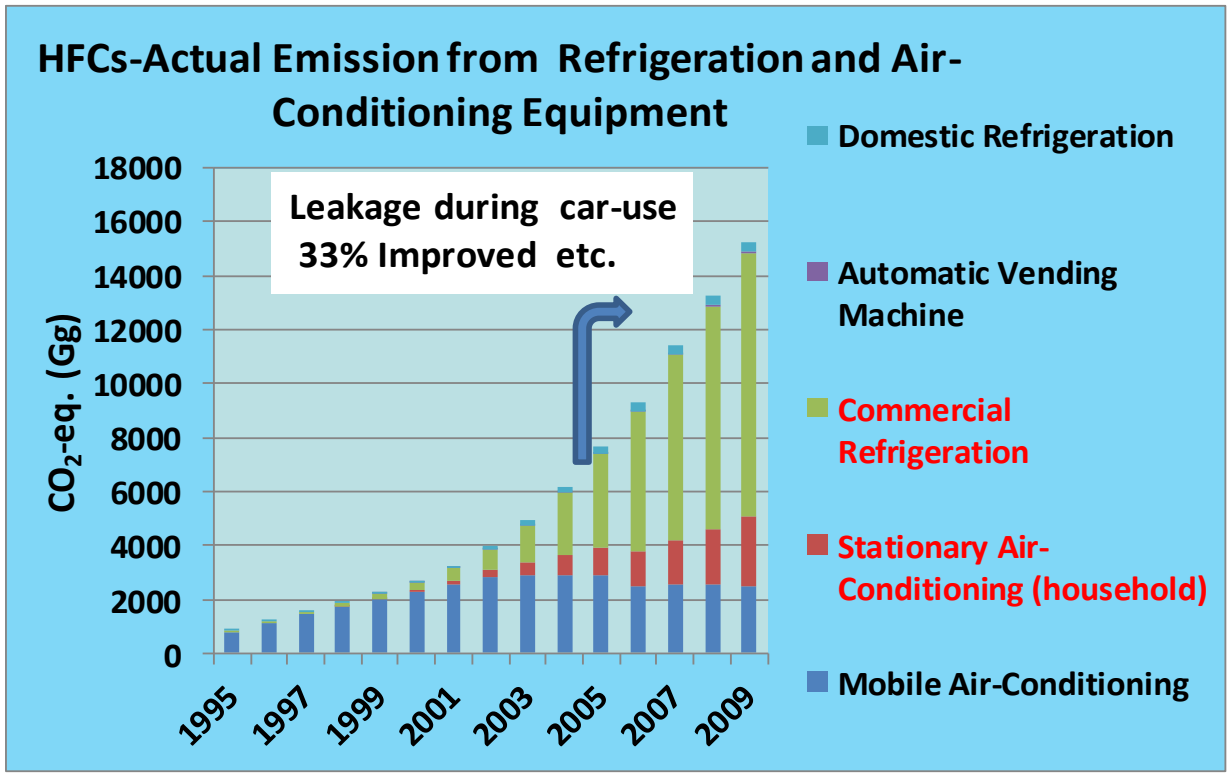

"Commercial Refrigeration" is the most Concerned Sub-Category

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

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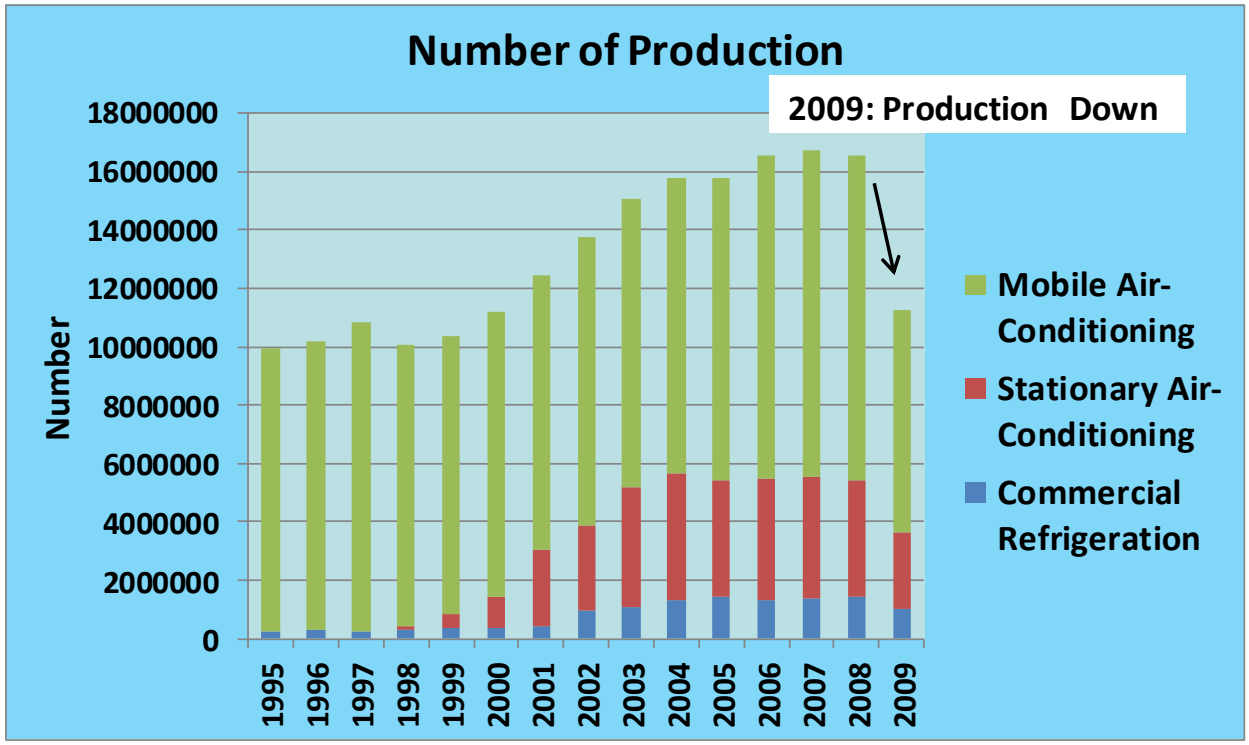

The number of "Commercial Refrigerator" is the smallest, however The emission is the largest

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

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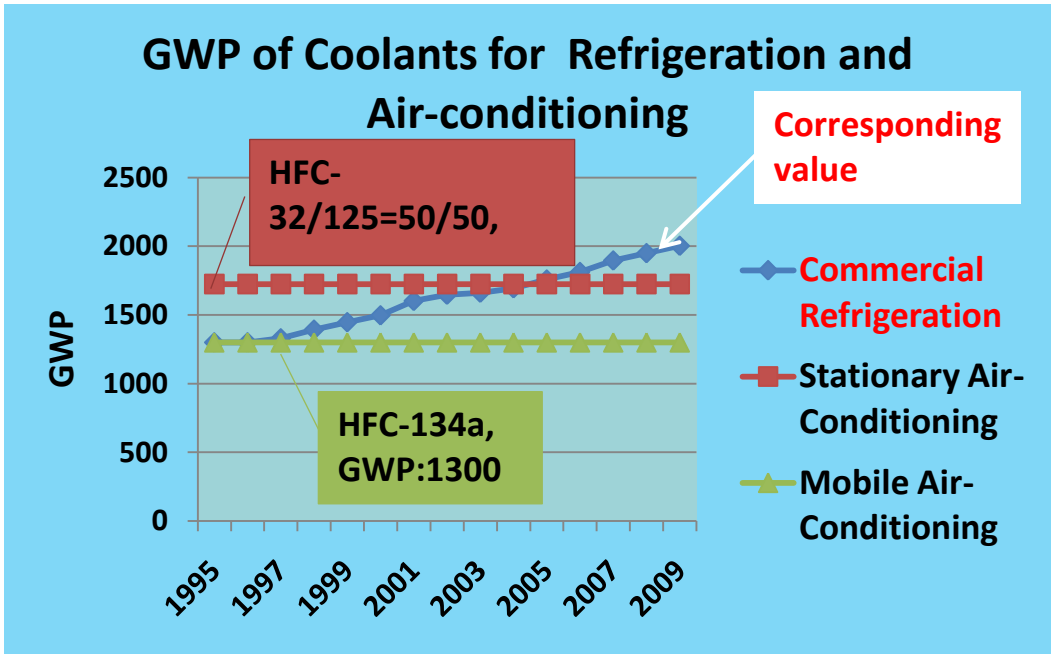


Commercial refrigeration: Substitution from HCFC to HFC R404A (ODP=0, GWP=3750) etc. has been On Going

"Global Warming, Chemical and Bio Sub-Group, INDUSTRIAL STRUCTURE COUNCIL" in "Ministry of Economy Trade and Industry" has been focusing on Mitigation-Measures for "Commercial Refrigeration"

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Mobile Air-Conditioning , Methodology

Country Specific Index for calculating HFCs-Emissions from Cars

Index	Unit
Car production with HFC-Air-Conditioning	1,000 vehicles
Emission during production	g / vehicle
All Cars having HFC-Air-Conditioning	1,000 vehicles
Average filled refrigerant per car	g / vehicle
Fugitive refrigerant per car during usage	g/vehicle
Repairing ratio	%
Fugitive refrigerant rate per repaired car	%
Completely collapsed car	1,000 vehicles
Fugitive refrigerant per completely collapsed car	g / vehicle
Scrapped car	1,000 vehicles
Fugitive refrigerant per scrapped car	g / vehicle
Recycled amounts	t
Emissions of HFC-134a	t
GWP	----

Emission during Production

Emission during Usage

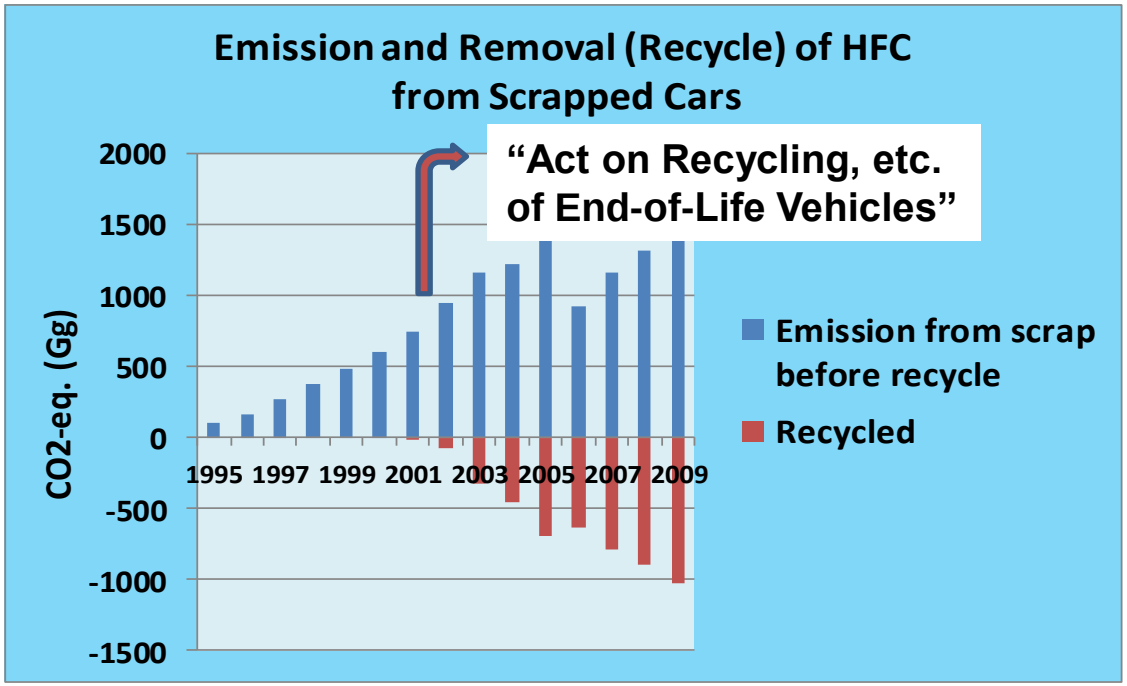
Emission from Repairing

Emission from Completely Collapsed

Emission from Scrap

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Mobile Air-Conditioning, Recycling from Scrapped Cars



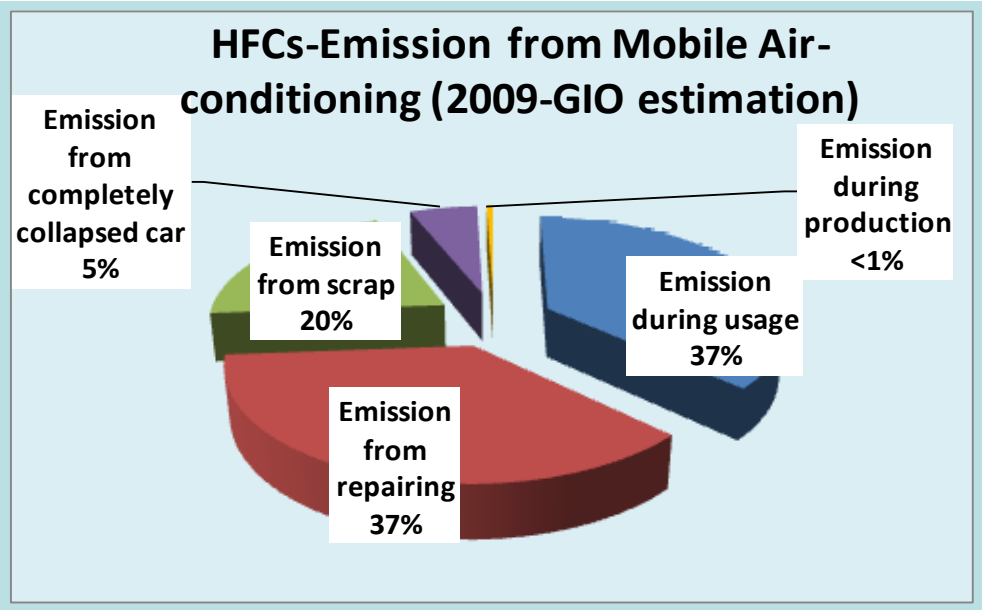
Act (Law) as Mitigation-Measure seems very effective for Cars.

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Emission-Analysis from Mobile Air-Conditioning

HFCs-Emission from "Leak during Production of Automobiles" occupies only < 1% as shown below.

So, whether producing cars or not, does not give an impact.



Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Tentative EF of Mobile Air-Conditioning

Tentatively Calculated CS Emission Factor for Automobiles:

54 in FY 2000, 48 in FY 2005, 39 in FY2009

Emission(Gg CO_2-eq.)=Above EF × Number of Cars containing HFC-134a

It is clear that Emission from Mobile Air-Conditioning has been improved consistently

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Tentative EF of Stationary Air-Conditioning (House Hold)

Tentatively Calculated CS Emission Factor for Stationary Air Conditioner:

38 in FY 2000, 39 in FY 2005, 49 in FY2009

Emission(Gg CO_2-eq.)=Above EF × Number of Air-Conditioner containing HFC-32/125

Tentative EF of Commercial Refrigeration

Tentatively Calculated CS Emission Factor for Commercial Refrigerator:

150 in FY 2000, 520 in FY 2005, 900 in FY2009

Emission(Gg CO_2-eq.)=Above EF × Number of Refrigerator

Reference: National Greenhouse Gas Inventory Report and CRF of JAPAN

Conclusions:

1. In Japan, "Global Warming, Chemical and Bio Sub-Group, INDUSTRIAL STRUCTURE COUNCIL" in "Ministry of Economy Trade and Industry" has been focusing on "Commercial Refrigeration".
   Substitution from HCFC/high-GWP HFC to lower-GWP HFC is needed.

2. In Japan, Destruction-Unit Installation to Production Line and Recycling System from Scrapped Cars seem to be the most effective Mitigation-Measures.

3. Let's estimate F-gases (especially HFCs), from Next NC , if not yet.

Thank you so much