Japan's Policies of Fluorocarbons Management

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1. **Overview of Legislations and Regulations for Fluorocarbons in Japan.**

2. Control measures of Manufacture and Import of Fluorocarbons

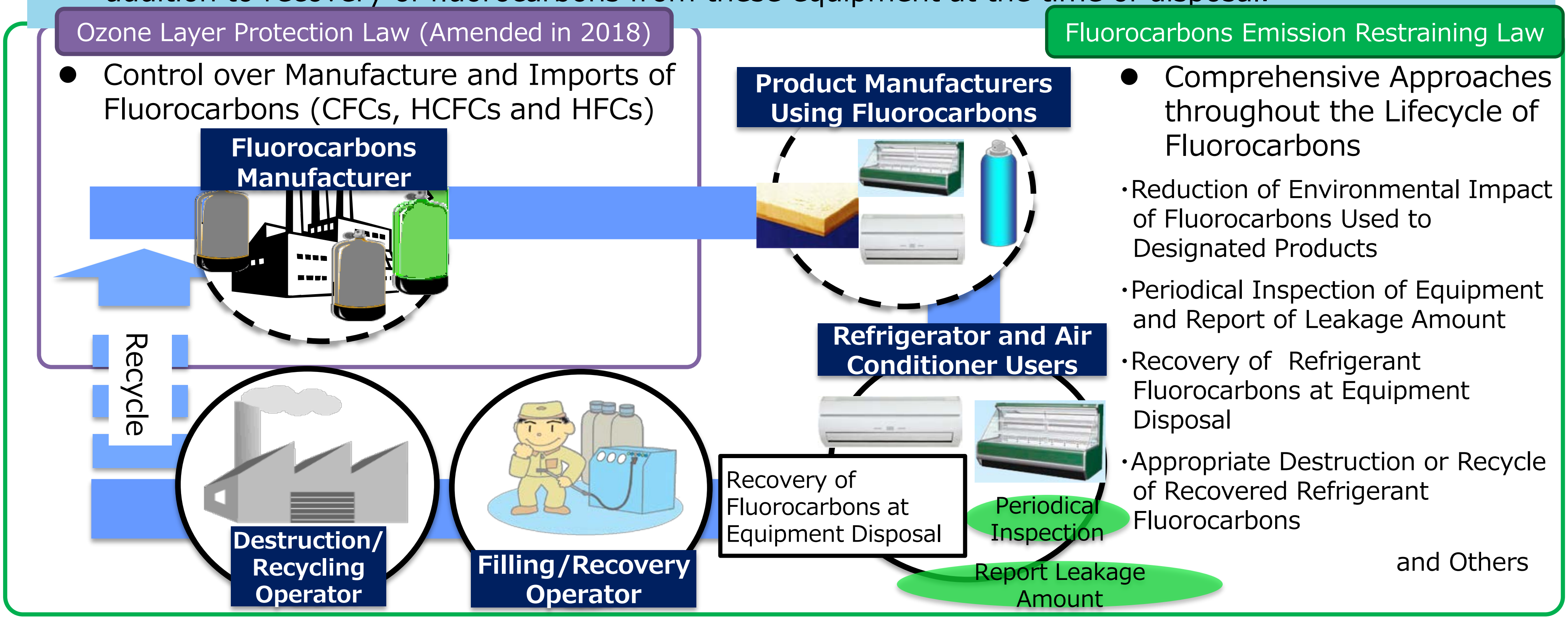
   (Revised Ozone Layer Protection Law in accordance with the Kigali Amendment)

3. Emission Control of Fluorocarbons

   (Enhancing Recovery of Fluorocarbon refrigerants at the time of equipment disposal)

Overview of Legislations and Regulations for Fluorocarbons

- **Act on the Protection of the Ozone Layer Through the Control of Specified Substances and Other Measures (Ozone Layer Protection Law)**: enacted in 1988. In order to implement obligation to reduce production and consumption of fluorocarbons based on Montreal Protocol, **<u>manufactures and imports of fluorocarbons are controlled</u>**. Pursuant to the Kigali amendment, **<u>HFCs</u>** become among those **<u>subject to be controlled from 2019</u>**.
- **Act on Rational Use and Proper Management of Fluorocarbons (Fluorocarbons Emission Restraining Law)**: The Fluorocarbons Recovery and Destruction Law (enacted in 2001) was amended in 2013. Aiming for restraining emission of fluorocarbons, the Act **<u>provides comprehensive approaches throughout the lifecycle of fluorocarbons,</u>** including periodical inspection of commercial refrigeration and air-conditioning equipment using fluorocarbons, in addition to recovery of fluorocarbons from these equipment at the time of disposal.



(Note) The Relevancy of Ozone Layer Protection Law and Fluorocarbons Emission Restraining Law

		Ozone Layer Protection Law	Fluorocarbons Emission Restraining Law
Legal Objective		● Protection of Ozone Layer ● Appropriate and Smooth Implementation of the Montreal Protocol	● Restraining Emission of Fluorocarbons into the Atmosphere ● Rationalization of Use and Optimization of Maintenance/Management of Fluorocarbons
Scope of Control	Step	● Manufacture and Import	● Manufacture and Import/Use, Maintenance, and Disposal
	Gases	● Fluorocarbons (CFCs, HCFCs, HFCs)	● Fluorocarbons (CFCs, HCFCs, HFCs)
	Equipment	–	● Equipment Using Fluorocarbons
Minister Publication		● Baseline Limitation	● Estimated Use of Fluorocarbons
Control Measures	Manufacture	● Permission System	● Reduction of Domestic Shipments of Fluorocarbons 【Striving Provisions】
	Import	● Approval System (According to Foreign Exchange Control Law)	
	Manufacture of Equipment	–	● Reduction of Environmental Impacts of Fluorocarbons Used in Products 【Striving Provisions】
	Equipment Use, Maintenance, and Disposal of Equipment	–	● Obligation to Equipment Inspection and Maintenance ● Obligation to Report on Leakage of Fluorocarbons ● Obligation to Recover Fluorocarbons During Equipment Disposal

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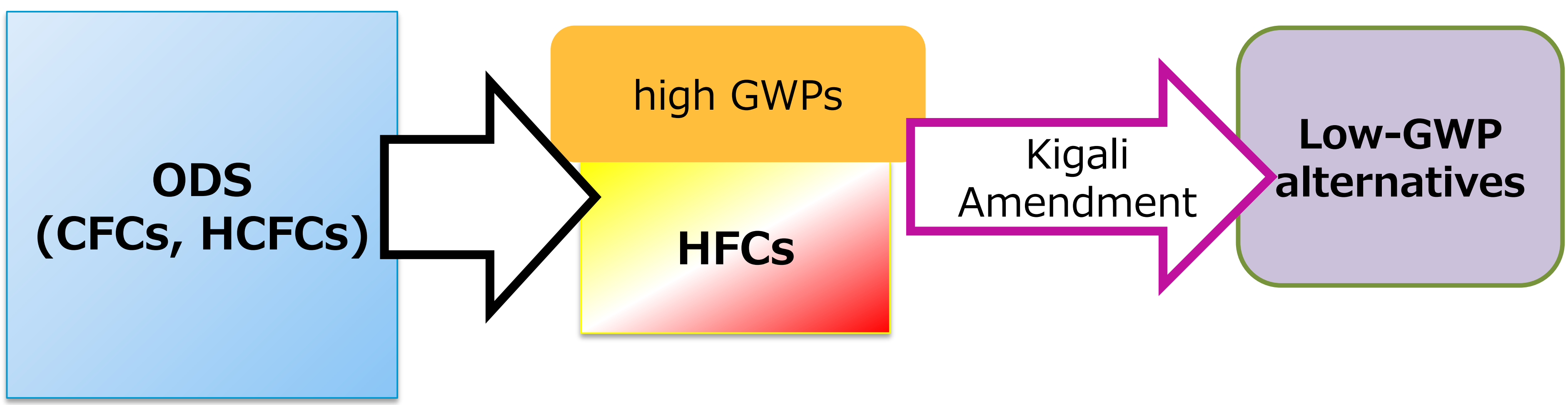
Key Points in the Kigali Amendment to Montreal Protocol

- In October 2016, the Montreal Protocol was amended in Kigali, Republic of Rwanda. The amended Protocol states obligation to **reducing (phase-down) production and consumption of HFCs with high greenhouse effect, which in turn have potential impact on global warming**.
- Japan determined to amend the Ozone Layer Protection Law in June 2018 as a national collateral measure to reflect the Kigali Amendment, and to implement measures such as **controlling manufactures and imports of HFCs**.
- Japan **accepted the Kigali Amendment in 2018**. **The control has entered into force on January 1, 2019**.



(Note) Overview of the Kigali Amendment

	Developed Countries※1	Developing Countries Group 1※2	Developing Countries Group 2※3
Baseline Years	2011-2013	2020-2022	2024-2026
Baseline Calculation (HFCs＋HCFCs)	Average Production/Consumption of HFCs in 2011, 2012, and 2013 ***Plus*** 15% of HCFC Baseline Production/Consumption	Average Production/Consumption of HFCs in 2020, 2021, and 2022 ***Plus*** 65% of HCFC Baseline Production/Consumption	Average Production/Consumption of HFCs in 2024, 2025, and 2026 ***Plus*** 65% of HCFC Baseline Production/Consumption
Freeze	None	2024	2028※4
Reduction Schedule ※5	2019: ▲10% 2024: ▲40% 2029: ▲70% 2034: ▲80% 2036: ▲85%	2029: ▲10% 2035: ▲30% 2040: ▲50% 2045: ▲80%	2032: ▲10% 2037: ▲20% 2042: ▲30% 2047: ▲85%

※1: Belarus, the Russian Federation, Kazakhstan, Tajikistan, and Uzbekistan which are categorized as developed countries are provided with different control measures (as to baseline calculation, the entry amount of HCFCs is 25% of the baseline calculation; as to the reduction schedule, the first phase – Step 1 will be 5% reduction in 2020, and the second phase – Step 2 will be 35% reduction in 2025).

※2: Developing Countries - Group 1 are developing countries which are not categorized as Group 2

※3: Developing Countries – Group 2 are India, Pakistan, Iran, Iraq, and the Gulf Countries

※4: Group 2 countries are to conduct a technical assessment 4 to 5 years prior to the freeze (2028), and the year to freeze will be discussed to be delayed for two years.

※5: All Parties will conduct a technical assessment in 2022 and once in every 5 years thereafter.

(Note) HFCs Subject to Control According to the Kigali Amendment

(List of 18 HFCs are Specified by a Government Ordinance in the Revised Ozone Layer Protection Law)

Substances	GWP	Substances	GWP
HFC-134	1,100	HFC-245ca	693
HFC-134a	1,430	HFC-43-10mee	1,640
HFC-143	353	HFC-32	675
HFC-245fa	1,030	HFC-125	3,500
HFC-365mfc	794	HFC-143a	4,470
HFC-227ea	3,220	HFC-41	92
HFC-236cb	1,340	HFC-152	53
HFC-236ea	1,370	HFC-152a	124
HFC-236fa	9,810	HFC-23	14,800

※GWP: Global Warming Potential (A Value Indicating Intensity of Global Warming Impact, with CO_2 being 1)

Summary of 2018 Revision of Ozone Layer Protection Law

- Under the revised law, **the manufactures and imports of HFCs** are controlled in accordance with the Kigali Amendment to fulfill the obligation to the phase-down of production and consumption of HFCs.

  ※**The same regulatory framework** have been applied to manufactures and imports of CFCs and HCFCs.

- The Law was enacted in 2018, and **came into force on January 1, 2019.**

Principal Measures

○The Ministry of Economy, Trade and Industry(METI) along with the Ministry of the Environment(MOE) **determine and publish the limit of production as well as consumption of HFCs** which Japan should comply in accordance with the Protocol.

○Manufactures and imports of HFCs should be accorded the following:

・Who seeks **to manufacture** must receive **permission** and be assigned **a quota** from the METI.

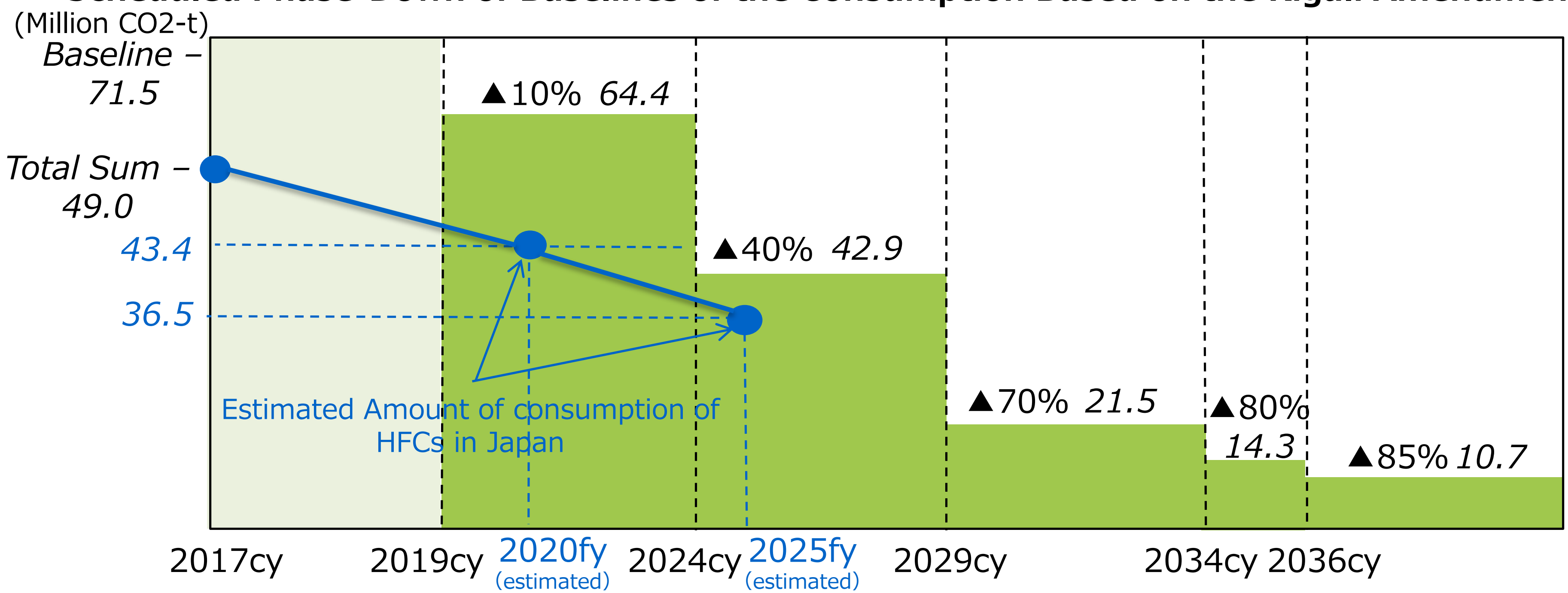
・Who seeks **to import** must receive **permission** and be assigned **a quota** from METI in accordance with provisions of Foreign Exchange and Foreign Trade Act.

※HFCs are used mainly for refrigerants in freezers and air conditioning equipment (approximately 90%), in other cases for foam agents, cleaning agents, and so forth.

Phase-Down of HFCs in Accordance with the Revised Ozone Layer Protection Law

- After January 1, 2019, the national baselines of production and consumption of HFCs are to be **cut back step by step (phase-down)**, in accordance with the Kigali Amendment.
- Japan will be well-prepared in advance by promoting **development and introduction of technologies of low-GWP refrigerant and equipment** to accomplish the target-baselines set each year, in which **2029 will be especially challenging year with (2.145 Mt-CO_2)**.
- In addition, our commitment to supporting fluorocarbons management with leading low-GWP refrigerant technologies will ensure **the contributions to the world**.

Scheduled Phase-Down of Baselines of the Consumption Based on the Kigali Amendment



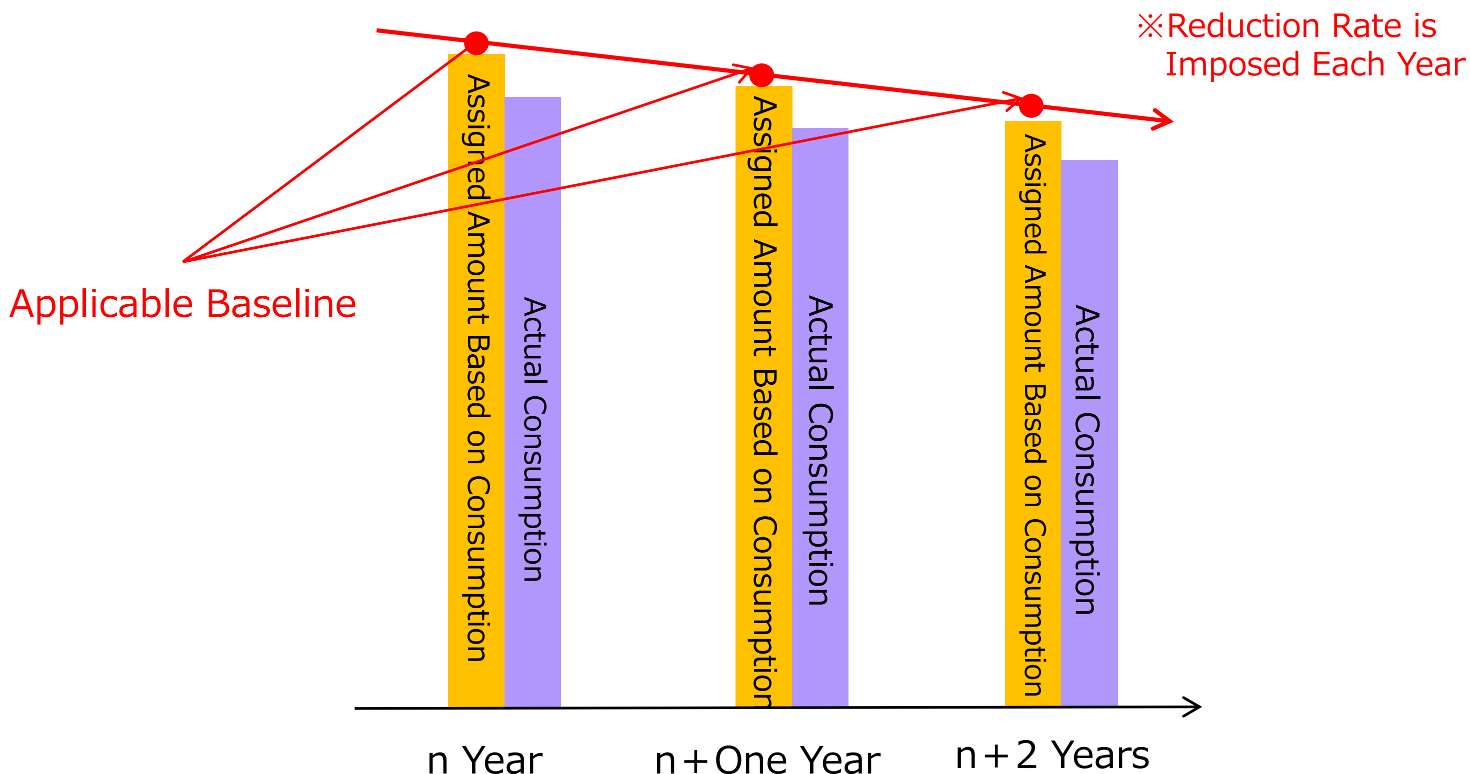
CY – Calendar Year(January to December), FY – Financial Year(April to March)

※ Baseline is extracted from average values calculated with actual results between 2011-2013.

(Note) Operational Concept of Quota System of HFCs

- To ensure progress of consumption reduction while maintaining sustainability of supply and businesses, individual business operator is to be assigned with an upper limit (hereinafter called as applicable baseline) which is based on the consumption amount (= manufacture – exports + imports; i.e., total domestic shipping).
- The applicable baseline for 2019 is to be calculated based on actual results, and the level of the baseline will be reduced every year.
- The year-on-year baseline reduction is to be impartial in principle to establish the fair system among the business operators.

<A View of Applicable Baselines among Individual Business Operators>



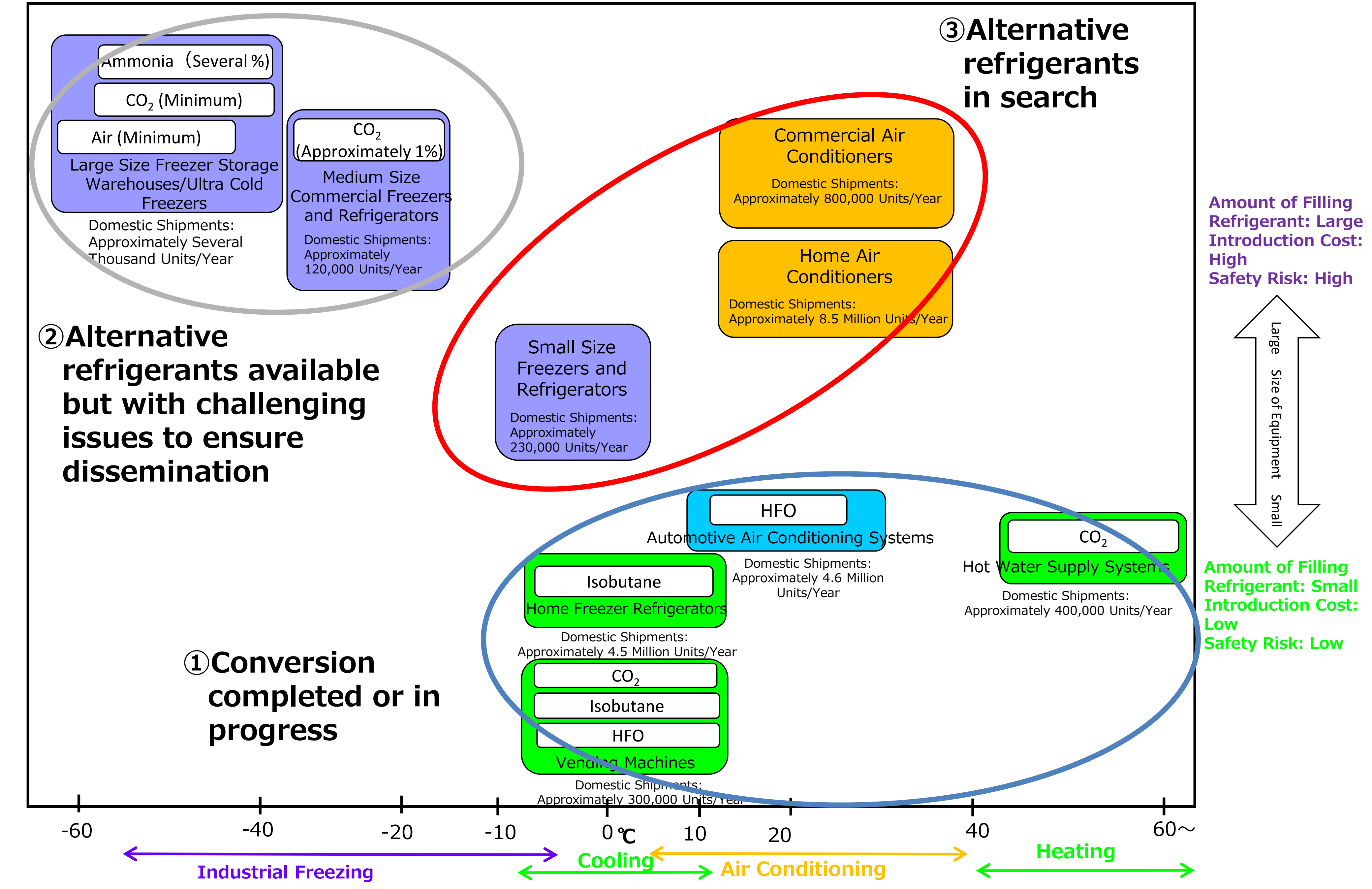
Situation of Introducing HFCs and Low-GWP Refrigerants

※**Blue Letters: Slightly Flammable**
Red Letters: Flammable

Areas	Fields	Current Alternative Fluorocarbons (HFCs) Refrigerants (GWPs)	Low-GWP Refrigerants to be Used Instead of HFCs
① Conversion completed or in progress	Home Freezer Refrigerators	(HFC-134a（1,430）)	**Isobutane** ※Refrigerants For All Newly Shipped Items are Already Converted into Low-GWP substances
	Vending Machines	(HFC-134a（1,430）) (HFC-407C（1,770）)	CO2, **Isobutane,** **HFO-1234yf**
	Automotive Air Conditioners	HFC-134a（1,430）	**HFO-1234yf** ※Replacement is in Progress.
② Alternative refrigerants available but with challenging issues to ensure dissemination	Ultra-Cold Freezer Refrigerators	HFC-23（14,800）	Air
	Large Size Commercial Freezer Refrigerators	HFC-404A（3,920） HFC-410A（2,090）	**NH3**, CO_2
	Medium Size Commercial Freezer Refrigerators (Separately Installed Showcases etc.)		CO2
③ Alternative refrigerants in search	Small Size Commercial Freezer Refrigerators	HFC-404A（3,920） HFC-410A（2,090）	(Replacement Candidates being Searched)
	Commercial Air Conditioners	HFC-410A（2,090） **HFC-32**（675）	
	Home Air Conditioners	**HFC-32**（675）	

※GWP: Global Warming Potential (A Value Indicating Intensity of Global Warming Impact, with CO_2 being 1)
※HFC-407C: Mixed Refrigerant of HFC-32, 125, and 134a (23:25:52)
HFC-404A: Mixed Refrigerant of HFC-125, 143a, and 134a (44:52:4)
HFC-410A: Mixed Refrigerant of HFC-32 and 125 (1:1)

(Note) The Present Mapping to Depict Alternative Refrigerants



Promoting Development and Introduction of Low-GWP Refrigerants Technologies

- Japanese government is set out to promote development and introduction of low-GWP refrigerants, assigning the following task to each ministry:

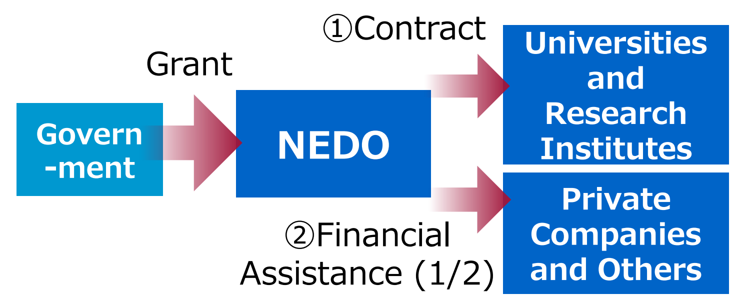
  METI – Research and development pertaining to **fields in which no alternative technologies** are expected at present.

  MOE – Support to introduce equipment with low-GWP technologies in fields nearly at practical use but **with issues such as cost**.

Development Project on the Next Generation Refrigeration and Air Conditioning Technologies, and Assessment Methods (METI)

Draft Budget: 650 Million Yen in FY2019 (250 Million Yen in FY2018) Time Period: 5 Years (2018-2022)

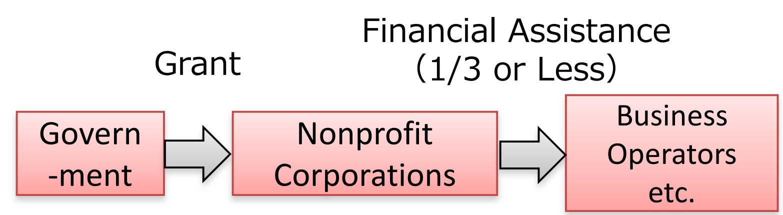
- As many of the low-GWP alternatives are classified with some level of **flammability**, their practical use should be assessed in terms of ignition risks depending on leakage.
- The goal is to **establish assessment methods on flammability** under industrial-academic cooperation. The methods are aiming for **international standardization**.
- Furthermore, **development of the low-GWP refrigerant and equipment technologies to satisfy the balance between low greenhouse effect as well as energy saving and safety,** will be assisted to thereby accelerate the process to practical use.



Project to Accelerate Introduction of Energy Saving-Type Natural Refrigerant Equipment To Realize Fluorocarbon-Free and Low Carbon Society (MOE)

Draft Budget: 7.5 Billion Yen in the FY2019 (6.5 Billion Yen in FY2018) Time Period: 5 Years (2018-2022)

- Whereas the technologies of an energy saving-type natural refrigerant to replace fluorocarbons equipment are available in some areas, **introduction of those technologies is limited due to high initial costs**.
- For this reason, **introduction of natural refrigerant equipment with high energy-saving capacity will be assisted and accelerated**, thereby we will proceed with fluorocarbon-free and low carbon society.
- In conjunction with this project, **constant demands** on energy-saving-base equipment using natural refrigerant will be created, contributing to efforts toward **cost reduction** among equipment manufacturers.



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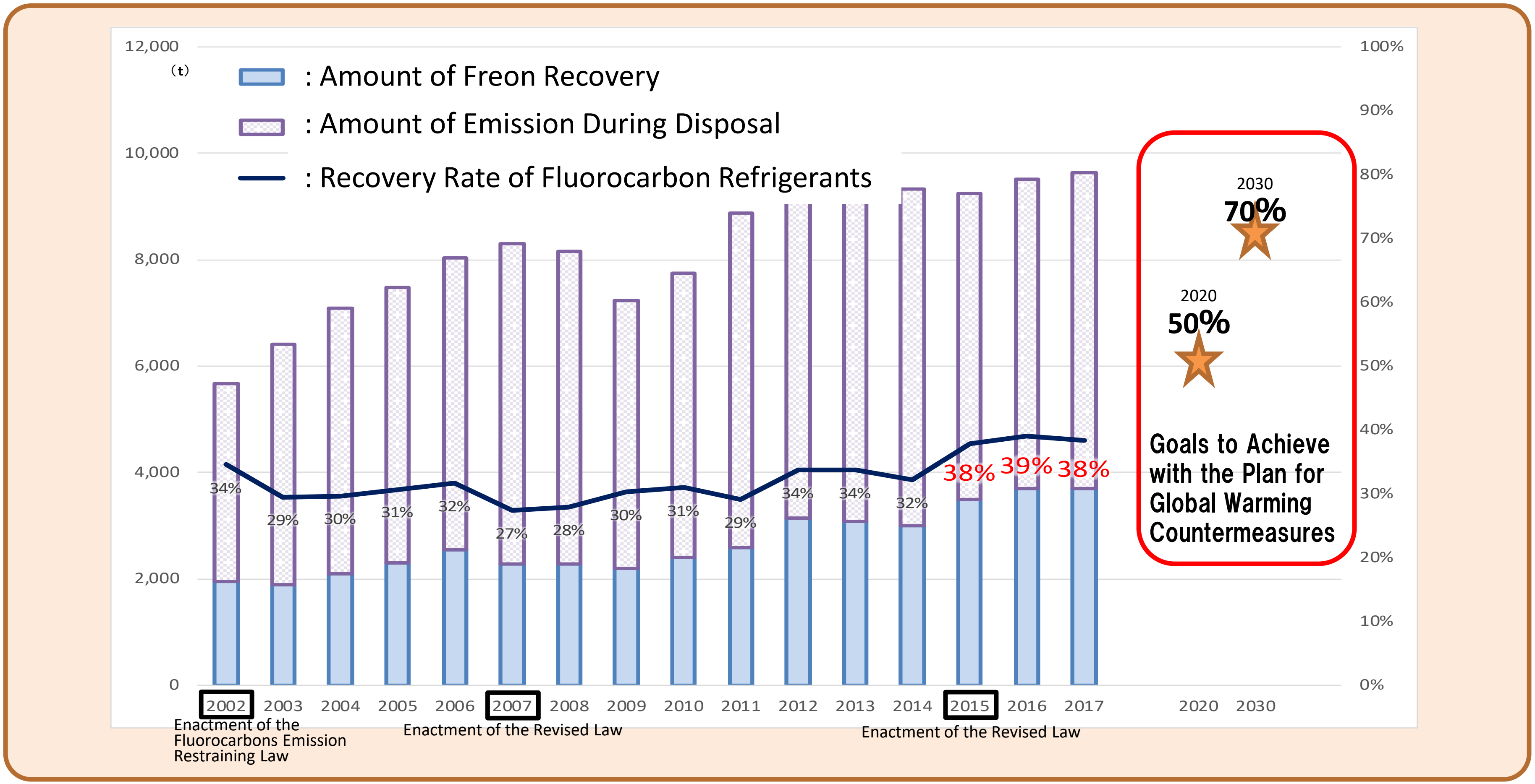
Current Situation of Fluorocarbons Recovery at the time of Equipment Disposal

- Fluorocarbon recovery rates at the time of equipment disposal have been **sluggish until 2014 at around 30%**, and still **remains low at below 40%**.
- **Any strategic approaches to strengthen of measures are in immediate need to enhance the recovery rate to accomplish the goal** stated in the Plan for Global Warming Countermeasures -Cabinet Decision adopted in May 2016.



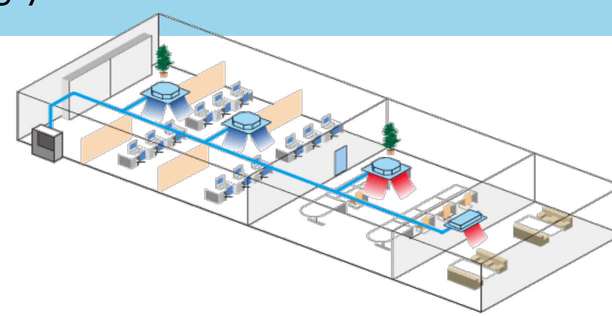
Issues Identified by Factor Analysis

- In order to **analyze the factors behind unrecovered fluorocarbon refrigerants**, METI and MOE collaboratively conducted surveys(1,200 valid responses of the 3,500 business operators as the subjects of the survey) and interviews.
- The activities revealed that **more than half of those unrecovered** (over 60% of fluorocarbon refrigerants remained in all equipment at the time of disposal) was due to the fact that recovery was **not done at the time of fluorocarbon equipment disposal, violating the law**.
- The above-mentioned operations are **the most obvious in the case where equipment is disposed during demolishing buildings**.
- Besides, **there has been no system to confirm whether fluorocarbon refrigerants are actually recovered during equipment disposal before delivering scrap and/or recycle operators**. For this reason, it was highly likely that **the fluorocarbons in the equipment were released** into the air in such cases the refrigerants had not been recovered.

※It should be noted that there is unrecovered fluorocarbon refrigerants even after the recovery process, especially with multi-split type air conditioning system (*) for buildings. With the assumption that the uncollected refrigerants are due to insufficient fluorocarbon recovery process, technological restrictions, and so forth, more surveys and analysis are planned accordingly.

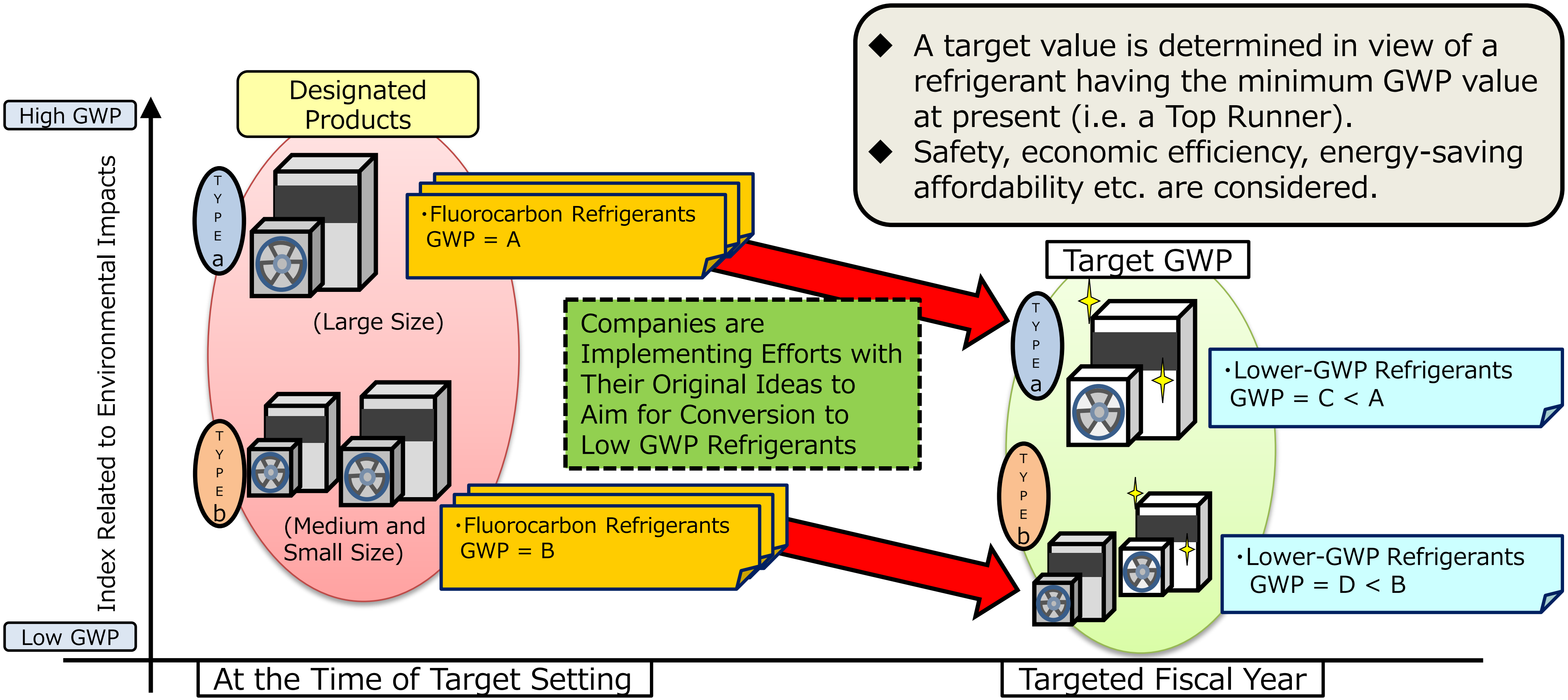
(*) Multi-Split Type Air Conditioning System

An air conditioning system comprising multiple indoor units to which refrigerant is supplied from a single outdoor unit to individually control air conditions of respective rooms of a building



(Note) Regulation on Designated Products Based on Fluorocarbons Emission Restraining Law

- The aim of Regulation on Designated Products is promoting lower-GWP alternatives into the products containing HFCs.
- In the regulation, manufacturing and import companies are required to meet a target of GWP value to their products if specified as the designated products, such as residential air conditioners, until the specified year. The target values are calculated by the weighted average with each product type that is to be shipped by the manufacturing and import companies.



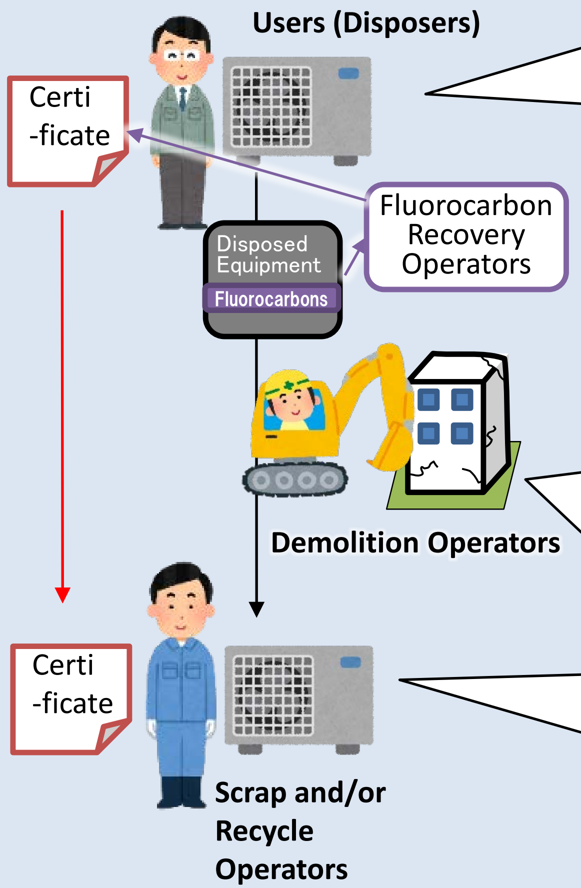
(Note) Products Designated in the Current Regulation

- The following 9 areas are subject of the designated products in consideration of the situation of technology development and safety assessment of products in response to the respective alternative nominations.
- A product that is exempt from its designation is under review to include whenever necessary as soon as the requirements are set. For those already included in the list specified, their target values and years for achievement are to be revised in a timely manner.

Sections (Types) of designated Products	Currently Used Main Refrigerants and GWPs	Target GWPs	Target Years (FY)
Residential Air Conditioners (Excluding Through-the-Wall Types)	R410A(2090), R32(675)	750	2018
Stores/Shop/Office Air Conditioners			
①Those with Legal Freezing Capacity of Less Than 3 Tons, Excluding Floor Type	R410A(2090), R32(675)	750	2020
②Those with Legal Freezing Capacity of 3 Tons or More Excluding ③ and Floor Type	R410A(2090)	750	2023
③Those Central Air Conditioners Using Centrifugal Chillers	R134a(1430), R245fa(1030)	100	2023
Automotive Air Conditioners (Limited only to Those Listed as Passenger Vehicles (Excluding Automobiles with 11 or More Passengers)	R134a(1430)	150	2023
Condensing Units and Stationary Type Freezer Refrigerator Units (Excluding Condensing Units with Rated Output of 1.5kW or Less)	R404A(3920), R410A(2090), R407C(1770), CO2(1)	1500	2025
Central System Freezer Refrigerator Equipment (Limited to Those Shipped for Newly Installed Freezer Refrigerators with Freezing Capacity of 50,000m^3 or More)	R404A(3920), NH3(1)	100	2019
Insulating Material Using Rigid Urethane Foams (Limited to Those Used for House Building Material and Formed at Building Sites)	HFC-245fa(1030), HFC-365mfc(795)	100	2020
Sprayer Exclusively Filled with Propellants (Excluding Uses That Require Non-flammability)	HFC-134a(1430), HFC-152a(124), DME(1)	10	2019

Amendment of Fluorocarbons Emission Restraining Law

- To improve fluorocarbon recovery rate at the time of disposal(nearly 40% in 2017), regulations based on Fluorocarbons Emission Restraining Law was strengthened last month.
- Stakeholders(users, demolition operators and scrap and/or recycle operators) owe additional obligations as following.
- According to this strengthened regulation, we improve fluorocarbon recovery rate more than 70% in 2030.



【At the time of Equipment Disposal】

- Adopt and impose a direct(non-probationary) penalty to a user with illicit behaviors of not recovering fluorocarbons
- Obligate users to submit the certificate of fluorocarbon recovery at the time of delivery to scrap and/or recycle operators

【At the time of Building Demolition】

- Improve effectiveness of guidance and supervision by prefectural governments
  - Obligate demolition operators to preserve documents as a proof of presence/absence of equipment
  - Define provisions related to request for submitting documents based on the Construction Material Recycling Act
  - Expand the scope of on-site inspection

【At the time of Delivery of disposed Equipment】

- Obligate scrap and recycle operators to check completion of fluorocarbon recovery by checking a certificate at the time they receive equipment.
- Receiving Equipment without a certificate is prohibited and adopted a direct(non-probationary) penalty.

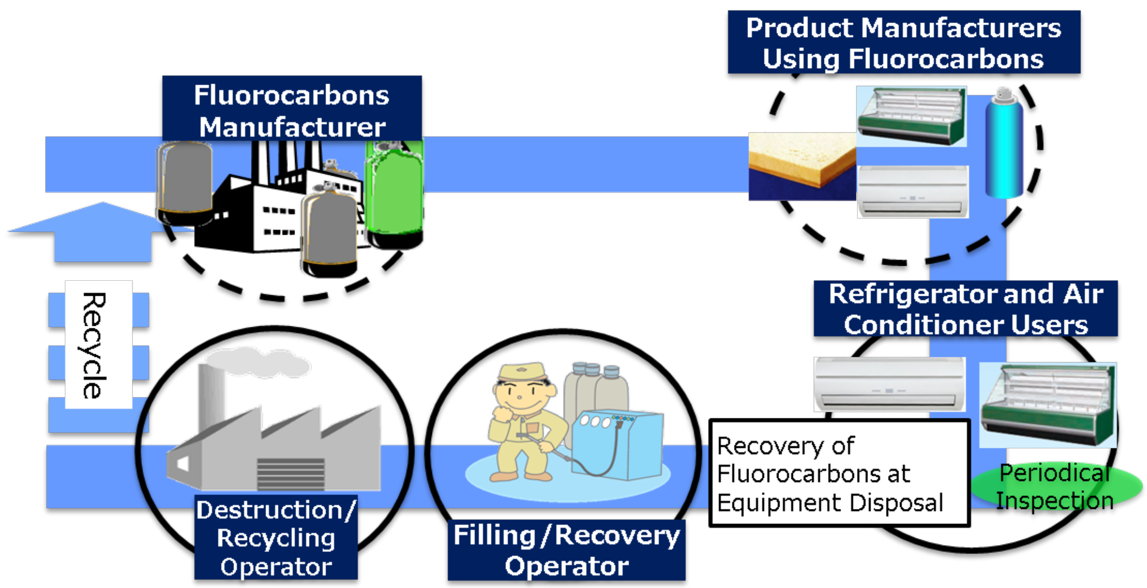
Lifecycle Management of Fluorocarbon

【Effect of the Life cycle management】

- We can achieve <u>additional emission reduction of HFCs</u> in accordance with the Kigali Amendment by taking measures as follows:
- ✓ <u>Measures to prevent leaks of HFCs in equipment use</u>.
- ✓ <u>Recovery and Destruction or Recycle of HFCs at Equipment Disposal</u>

【International application of the Life cycle management】

- **<u>Government of Japan hopes to share the view, and can provide assistance based on our expertise to prevent leaks in equipment use, and recover and destroy or recycle at equipment disposal.</u>**



Thank you for your attention.

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