経済産業省

Japan's Policy Measures for Phasing-down HFCs

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Kohei Yamamoto
Fluoride Gases Management Office
Ministry of Economy, Trade and Industry

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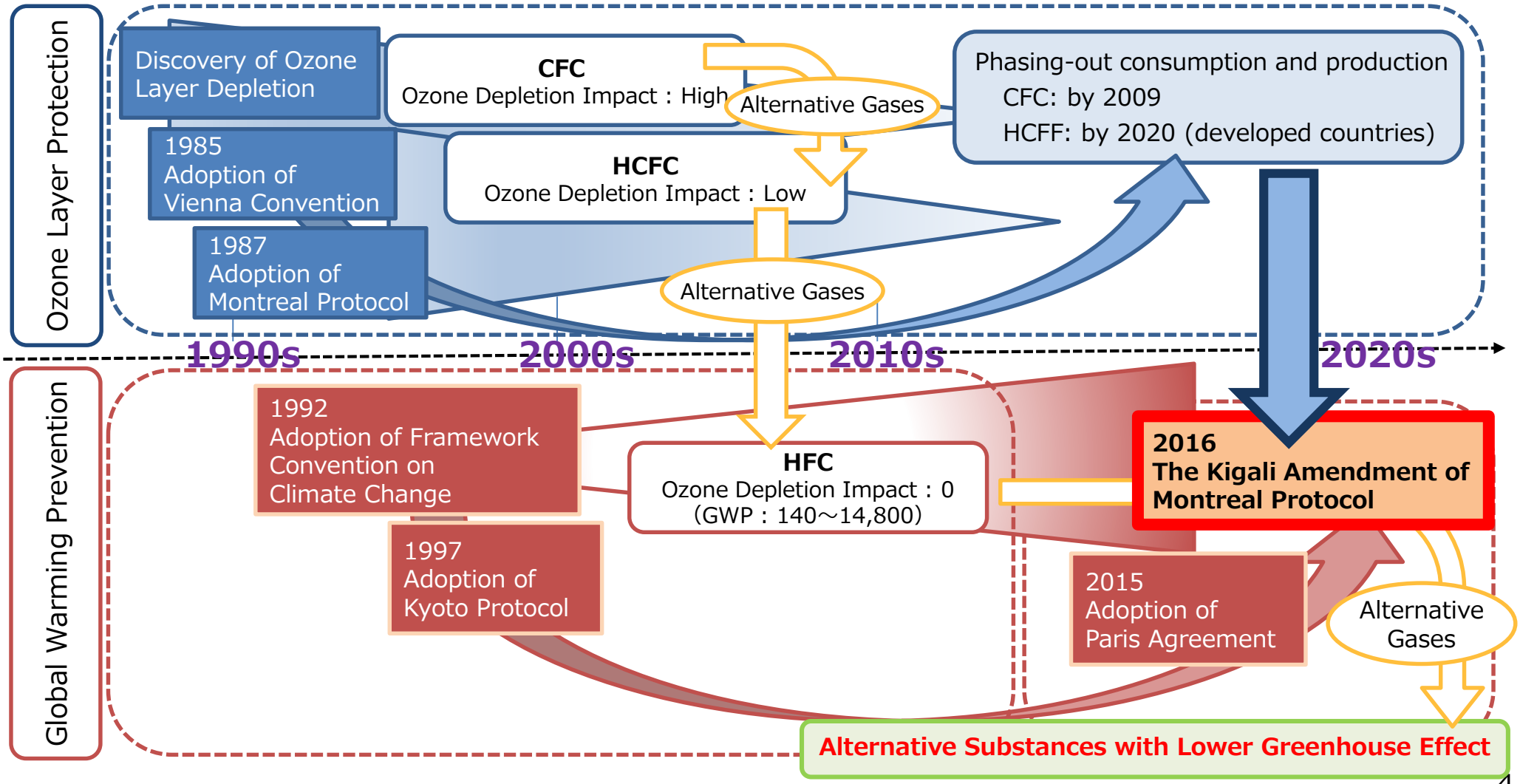
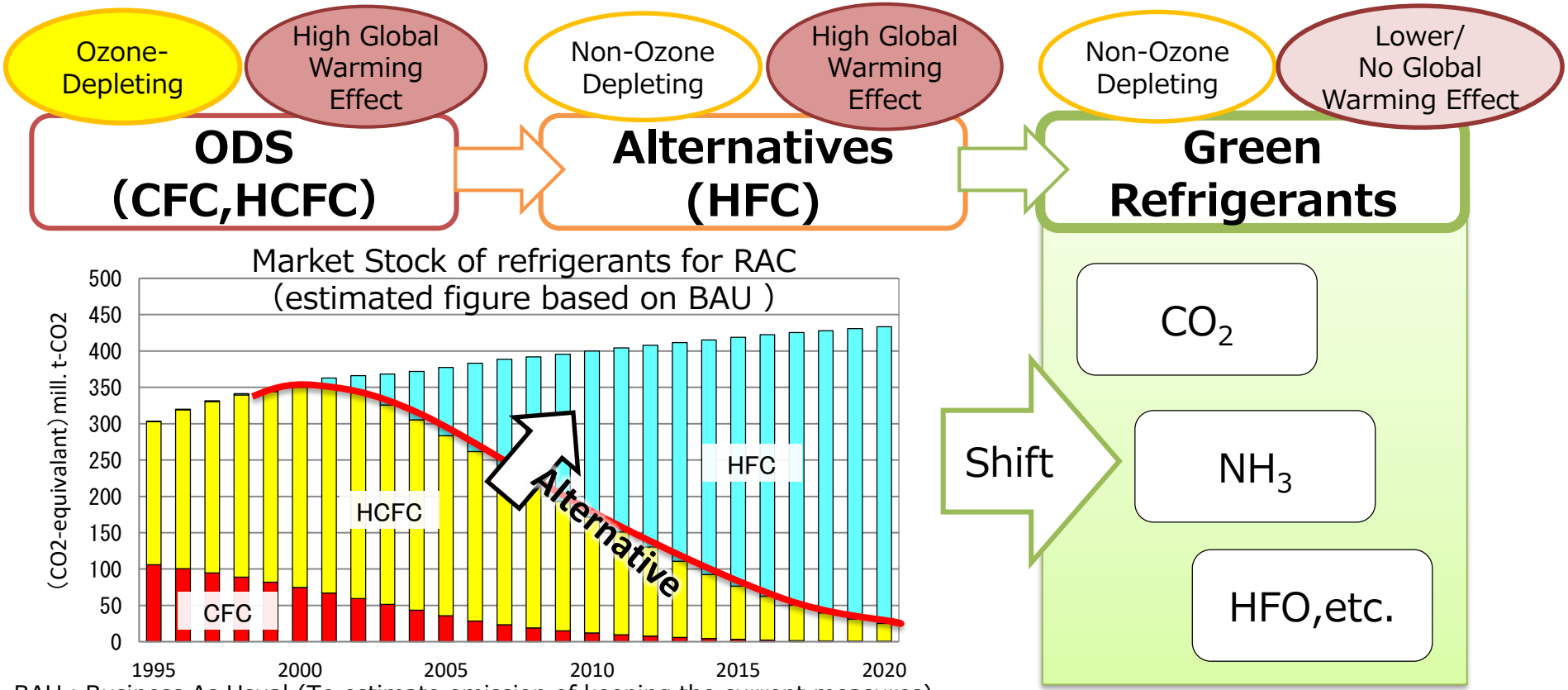
Montreal Protocol as International Agreement

- Aimed to protect the Ozone Layer by reducing consumption and production of Ozone Depleting Substances (ODS)
- In 2016, **Kigali Amendment was adopted to include HFCs for preventing global warming**



Shift from Ozone Depleting Substances to Alternatives

- Ozone Depleting Substances (CFCs and HCFCs) were strictly regulated internationally, so they have been replaced by alternative substances (HFCs) which has no Ozone-Depleting Potential.
- However, strong global warming effect of HFCs has been getting concerned in the international discussion on the climate change.
- Therefore, shifting to lower-GWP refrigerants (called as "Green Refrigerants") is the next target of our policy measures.



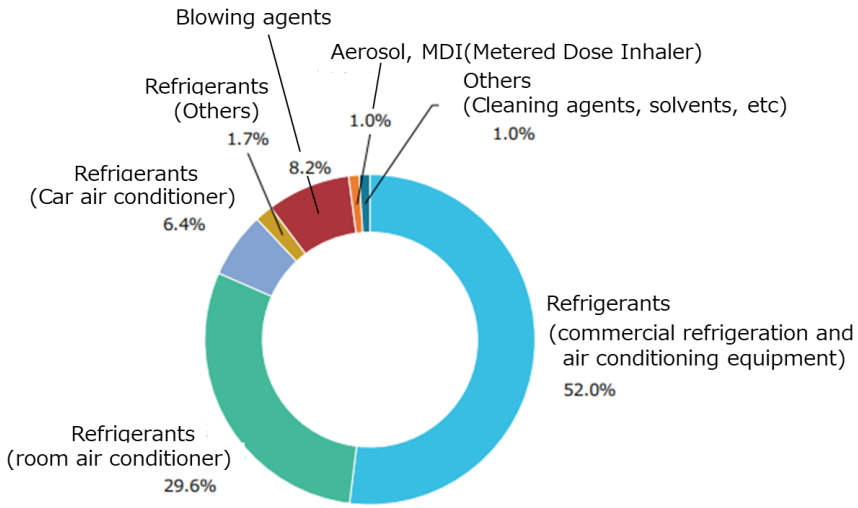
BAU : Business As Usual (To estimate emission of keeping the current measures)

HFCs' Impact on Global Warming in Japan

- HFCs are non-ozone-depleting but powerful greenhouse gases with GWPs between 10 and 10,000 times higher than CO2.
- 2014, HFC emissions had been on the rise, but they started to drop in 2022.
- More than 80% of HFCs is consumed as refrigerants for air-conditioner and freezer, thus HFCs reduction from those equipment is the main target of our policy measures.

Unit : Mill t-CO2	Emission in 2013 [Share]	Emission in 2023 [Share]	2023		
			Emission [Share]	Rate of Change	
				vs.2013	vs.2022
Total	1,395 [100%]	1,116 [100%]	1,071 [100%]	−23.3%	− 4.0%
CO_2	1,314 [94.2%]	1,031 [92.4%]	989 [92.3%]	−24.8%	− 4.1%
HFCs	13.4 [1.6%]	33.0 [3.0%]	31.7 [3.0%]	+43.8%	− 3.9%

Breakdown of HFCs emission



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Two Regulatory Measures for Reducing HFCs Emission

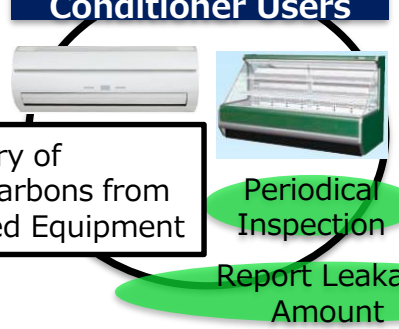
- **Ozone Layer Protection Law : To comply with the Montreal Protocol, this law aims to control consumption and production of controlled substances by regulating their productions and imports.**
- Fluorocarbons Emission Restraining Law : This law aims to control emissions over the lifecycle of Fluorocarbons from up-stream to down-stream.

Ozone Layer Protection Law

- Control over manufacturers and importers of Fluorocarbons (CFCs, HCFCs and HFCs)

Recycle

Recovery of Fluorocarbons from Disposed Equipment



Fluorocarbons Emission Restraining Law

- Comprehensive approaches throughout the lifecycle of Fluorocarbons

・Reduction of environmental impact of Fluorocarbons used in designated products

・Periodical inspection of equipment and report of leakage amount

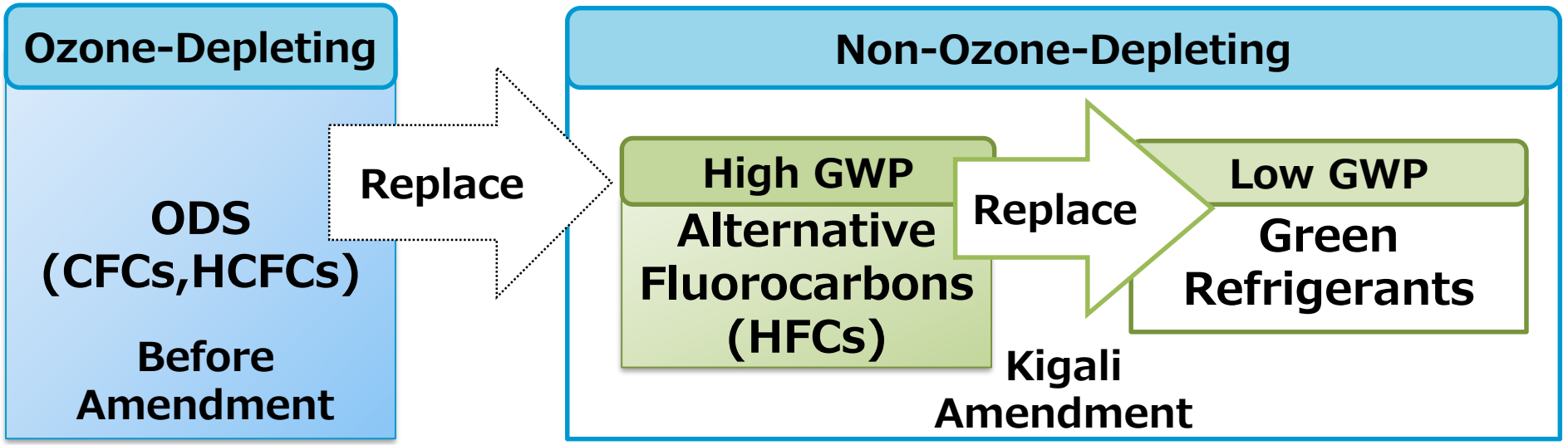
・Recovery of refrigerant Fluorocarbons at equipment disposal

・Appropriate destruction or recycle of refrigerant Fluorocarbons recovered from equipment

and Others

Kigali Amendment for Phasing-down HFC

- In October 2016, the Montreal Protocol was amended in Kigali, Republic of Rwanda. The amended Protocol obliges its Parties to reduce (phase-down) production and consumption of HFCs with strong concern on its potential impact on global warming.
- Japan amended the Ozone Layer Protection Law in June 2018 for reflecting the Kigali Amendment by introducing regulatory measures such as controlling manufactures and imports of HFCs.
- Japan accepted the Kigali Amendment in December 2018 (160 countries have ratified the Amendment as of 3 July 2024).
- The amended Ozone Layer Protection Law have entered into force on 1 January 2019.



Ozone Layer Protection Law – 2018 Amendment

- Japan amended the Ozone Layer Protection Law in June 2018 for reflecting the Kigali Amendment.
  - Introduced regulatory measures such as controlling manufactures and imports of HFCs.
  - The amended law was enacted in December 2018 and came into force on 1 January 2019.
- Japan accepted the Kigali Amendment in December 2018.

Details of Introduced Policy Measures

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

○ Manufacturers and importers of HFCs obliged to request METI's permission as a quota for manufacture/import of HFCs.

- Import is subject to the provisions and procedure of the Foreign Exchange and Foreign Trade Act.

○ HFCs as feedstock in the manufacture of other chemicals are exempted from the quota after the check and confirmation conducted by METI.

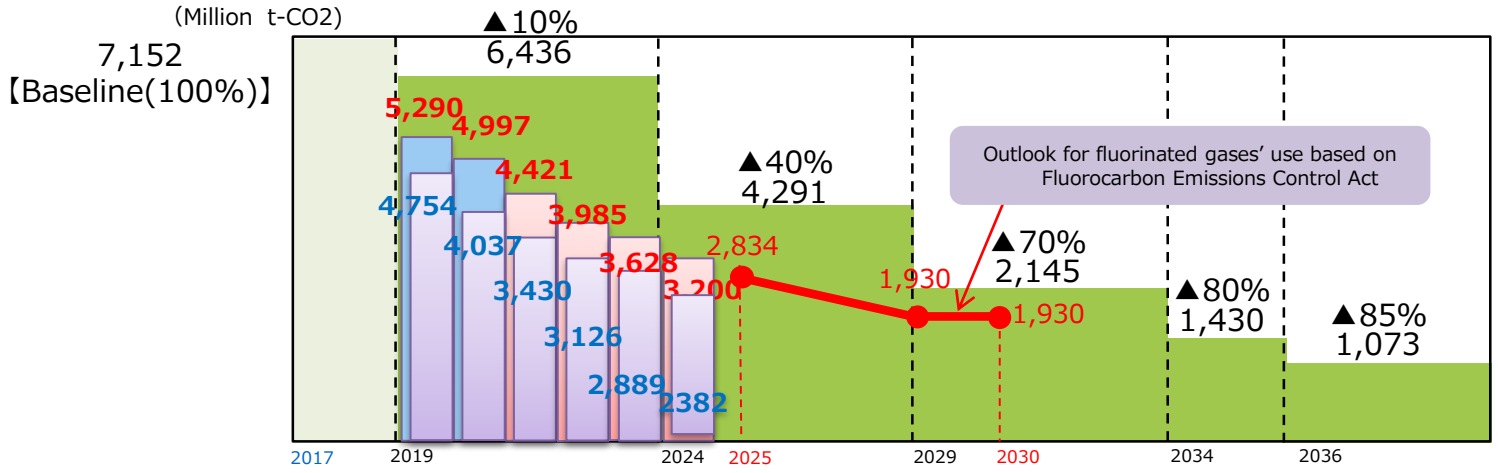
Results on consumption volume from 2019 to 2024

- 2024 quota on consumption was allocated to 32.00 million tones of CO2 equivalent for basic and special uses. This value is far below the target consumption by 25%. The actual consumption is also under the quota in 2024 . We have achieved the target affordably.

-Basic quota : 31.58 million tons of CO2 equivalent (producers eight businesses 23 importers)

-Special quota : 0.42 million tons of CO2 equivalent (producers three businesses nine businesses)

※Special quota are allocated for fire extinguishing agents, inhalers and use in test and research



※ Baseline is calculated based on the average of actual value 2011-2013

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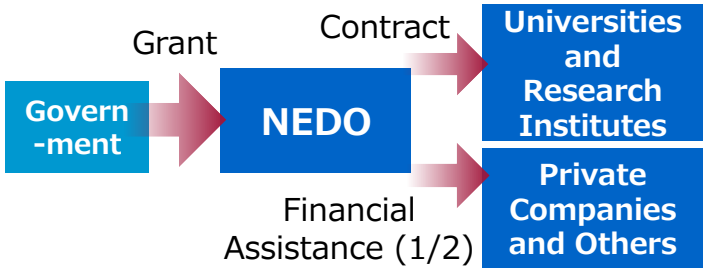
Government Supports for Low GWP Refrigerants

- METI and MOE respectively support development and introduction of low-GWP refrigerants as follows:
  - METI: Research and development on the next-generation low-GWP refrigerants.
  - MOE: Financial support to low-GWP equipment for its introduction into the market.

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

Budget: 500 Million Yen in FY2025 Time Period: 5 Years (2023-2027)

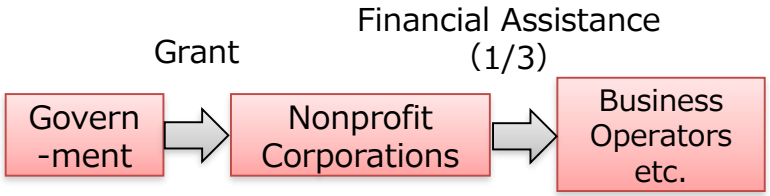
- The goal is to **establish risk assessment methods on candidate alternative refrigerants** under industrial-academic cooperation. The results of the assessment are expected to be utilized for development of air-conditioners.
- Financial assistance is provided to private companies for **developing low-GWP refrigerants and equipment technologies**, which satisfy the balance among low greenhouse effects, energy conservation and products safety.



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

Budget: 7.0 Billion Yen in FY2025 Time Period: 5 Years (2023-2027)

- Although technologies of an energy saving-type natural refrigerant to replace fluorocarbons are available in some uses, **introduction of those technologies is limited due to high initial costs**.
- The government supports **introduction of natural refrigerant equipment with high energy-saving capacity** to realise fluorocarbon-free and low carbon society.



Alternative Refrigerants – High GWP to Low GWP

Stage	Sector	Present Alternative Refrigerants (GWPs)	Low-GWP Alternatives Available or will be Available
Low-GWP alternatives are available or will be available soon	Home Freezers & Refrigerators	[HFC-134a (1,430)]	Isobutane
	Vending Machines	[HFC-134a (1,430)] [HFC-407C (1,770)]	CO2, Isobutane, HFO-1234yf
	Automotive Air Conditioners	HFC-134a（1,430）	HFO-1234yf
Low-GWP alternatives with some challenges on its further dissemination (e.g. cost reduction)	Ultra-Cold Freezers	HFC-23（14,800）	Air
	Large-scale Commercial Freezers & Refrigerators	HFC-404A（3,920） HFC-410A（2,090）	NH3, CO2
	Medium-scale Commercial Freezers & Refrigerators (e.g. Stand-alone Showcases)		CO2
Low-GWP alternatives are still under development	Small-scale Commercial Freezers & Refrigerators	HFC-404A（3,920） HFC-410A（2,090）	*Candidate alternatives are under development*
	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 reference to CO_2 as 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)

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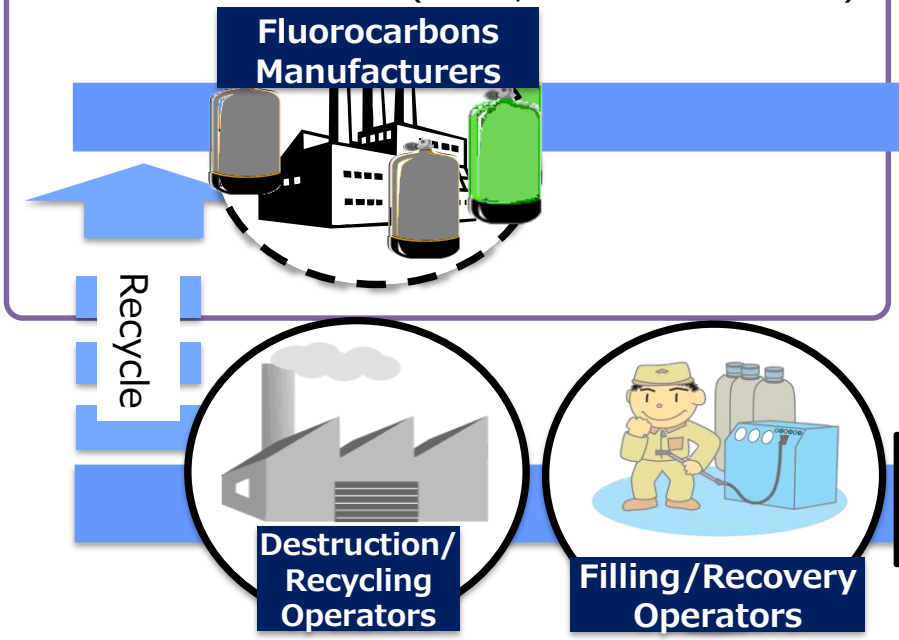
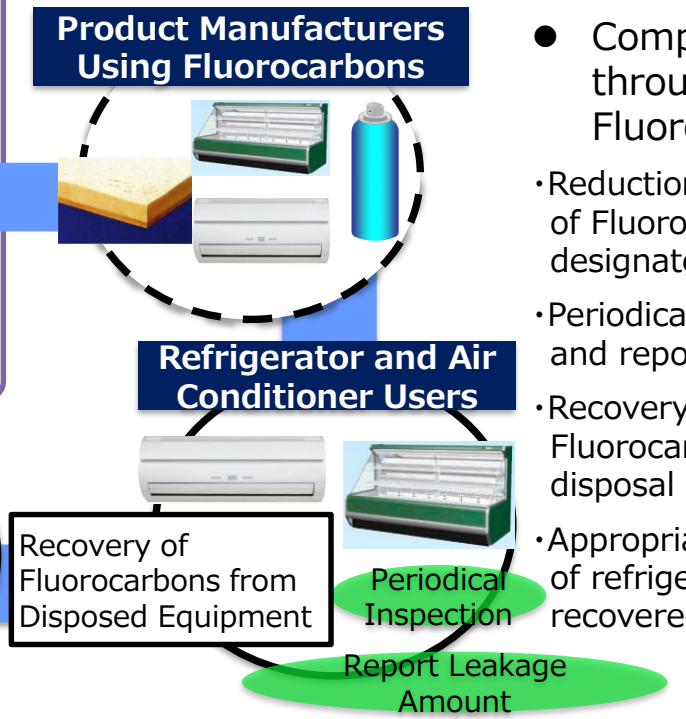
  Booklet in English: https://www.env.go.jp/earth/furon/files/englishmaterial_202303.pdf

Ozone Layer Protection Law

- Control over manufacturers and importers of Fluorocarbons (CFCs, HCFCs and HFCs)



Fluorocarbons Emission Restraining Law

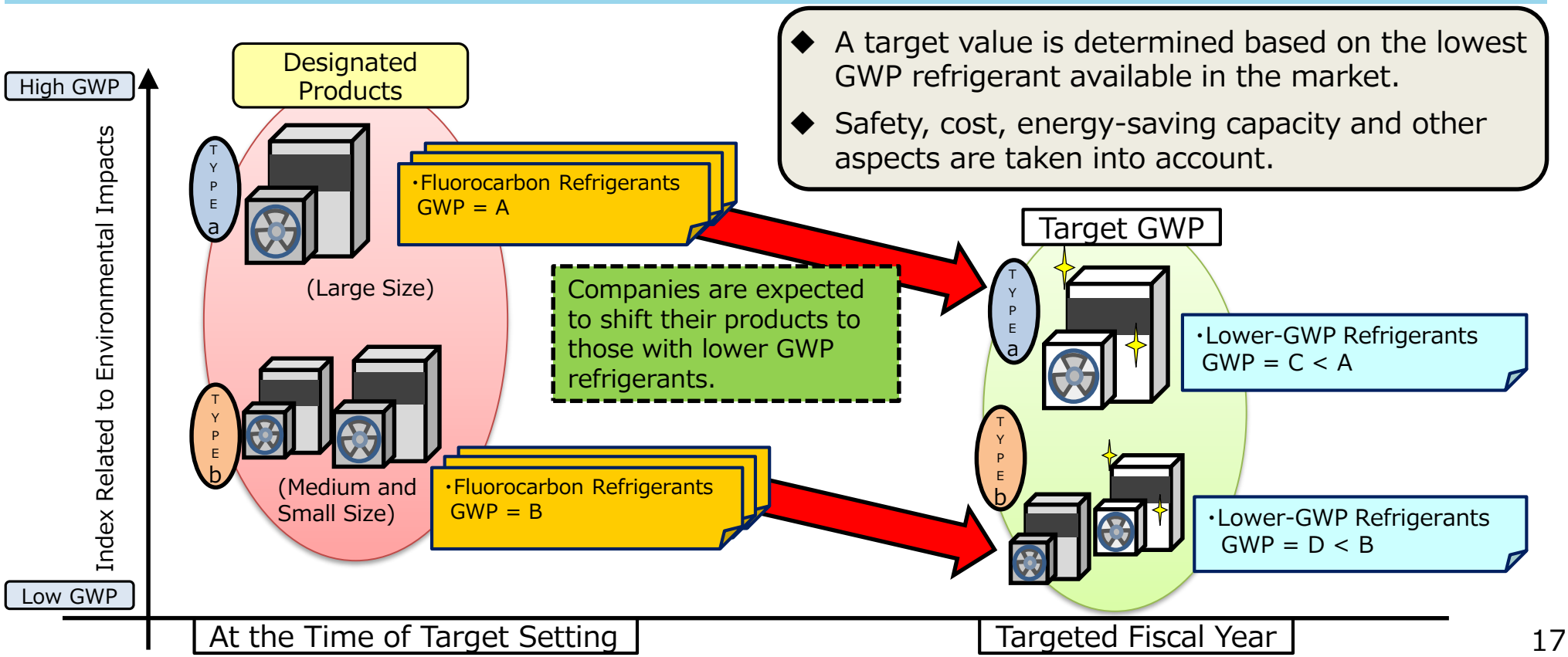


- Comprehensive approaches throughout the lifecycle of Fluorocarbons
  - ・Reduction of environmental impact of Fluorocarbons used in designated products
  - ・Periodical inspection of equipment and report of leakage amount
  - ・Recovery of refrigerant Fluorocarbons at equipment disposal
  - ・Appropriate destruction or recycle of refrigerant Fluorocarbons recovered from equipment

and Others

Promoting Low-GWP Top-runner Products

- Fluorocarbons Emission Restraining Law designates product categories, in which lower-GWP refrigerants are available in the market.
- Based on the best available product (called “top-runner”), the target value is determined in that product category with the target year for achieving that target value.
- Manufacturers and importers are required to meet the target GWP value for their products by the target year.



Promoting Low-GWP Top-runner Products

- Target GWP values and target year have been determined for each product category.

Specified Product Categories		Refrigerant Currently Used (GWP)	Target GWP	Target Year	Enforcement date
Residential Air-Conditioners		R410A(2090), R32(675)	750	2018	
Commercial Air-Conditioners					
Air-Conditioners for stores and offices		R410A(2090), R32(675)	750	2025	2025.4 Enforcement (revised)
Central Air-Conditioners	Centrifugal Compression Refrigeration Unit	R134a(1430), R245fa(1030)	100	2025	
	Others	R410A(2090)	750	2029	2029.4 Enforcement (revised)
Multiple-type Air-Conditioners for building use		R410A(2090)	750	2027	2027.4 Enforcement (revised)
Air-Conditioners for facilities		R410A(2090)	750	2029	2029.4 Enforcement (revised)
Gas engine heat pump Air-conditioner		R410A(2090)	750	2029	2029.4 Enforcement (revised)
Auto-motive Air Conditioners					
for cars		R134a(1430)	150	2023	
for buses and trucks		R134a(1430)	150	2029	
Condensing Unis/Stationary Refrigeration Units					
excluding those compressor with rated output of 1.5KW		R404A(3920), R410A(2090), R407C(1770), CO2(1)	750	2029	2029.4 Enforcement (revised)
others			150	2029	2029.4 Enforcement (added)
Refrigerate and freeze equipment combined unit for commercial use					
Commercial refrigerator and freezer for commercial use		R404A(3920) , R410A(2090), R407C(1770) , R134a(1430), CO2(1)	150	2029	
Show cases			150	2029	
Centralized Refrigerators					
Only for new refrigerated warehouses having effective volume of at least 50,000㎥ ※		R404A(3920), Ammonia(1 digit value)	100	2019	
Centrifugal Compression Refrigeration Unit（Others ※）		R134a(1430), R245fa(1030)	100	2029	2025.4 Enforcement (added)
Screw type compressor（Others ※）		R407c(1770), R448A(1386)	150	2031	2025.4 Enforcement (added)
Other than Centrifugal Compression Refrigeration Unit and Screw type compressor（Others ※）		R410A(2090)	750	2029	2025.4 Enforcement (added)
Refrigerate and freeze equipment using rigid polyurethane foam		HFC-245fa(1030), HFC-365mfc(795)	100	2024	
Vending machine with a Refrigerating or Freezing Function using rigid polyurethane foam			100	2024	
Rigid Polyurethane Form Stock Solution for residential use			100	2020	
Rigid Polyurethane Form Stock Solution for use other than residential use			100	2024	
Heat Insulting Materials (Using rigid polyurethane foam)			100	2024	
Aerosol Spray Cans（expect those requiring non-flammability)		HFC-134a(1430), HFC-152a(124), CO2(1), DME(1)	10	2019	

Achievement Status of Designated Products that Have Reached the Target Year

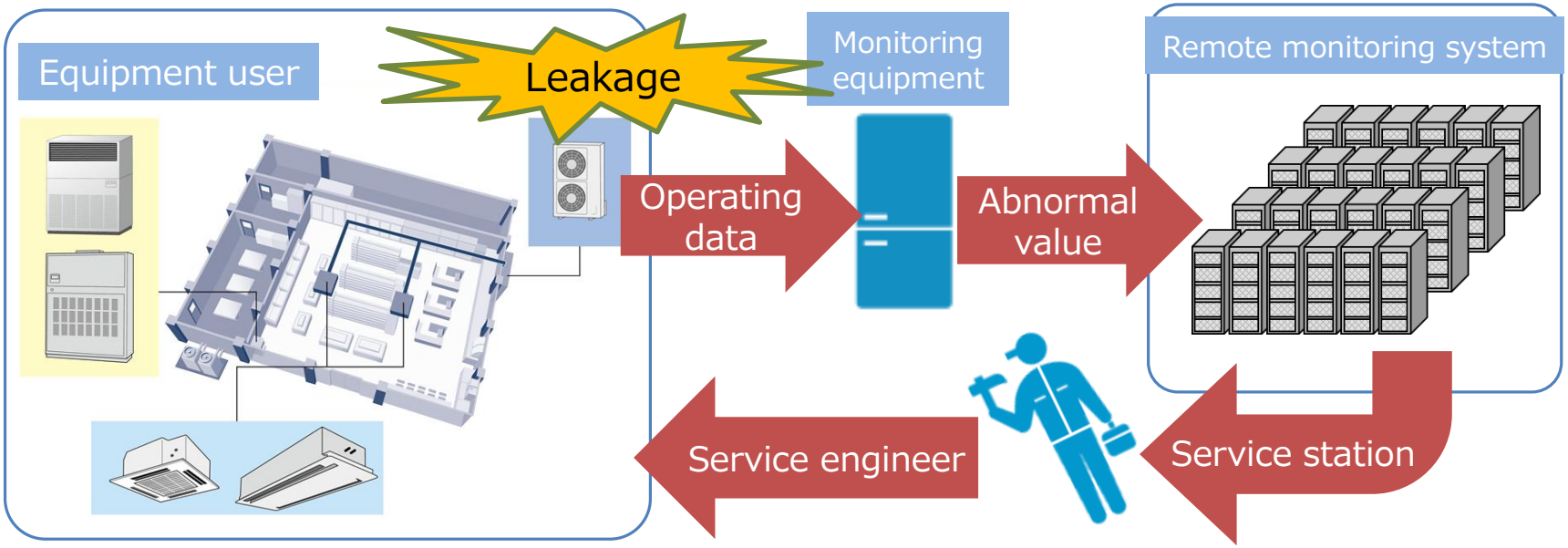
- For the products that have already reached their target year, the goals have generally been achieved.
- In the future, we will continue to monitor the achievement status of products that are approaching their target year and respond appropriately.
- For products that have already met their targets, we are also considering new top-runner products that are expected to be on the market, with a focus on setting even lower GWP target values and target years.

Product Categories	Target GWP VALUE	Target year	Achievement
Residential Air-Conditioners	750	2018	○ Weighted average GWP value for total category is 685. Refrigerant has been replaced by HFC-32 (GWP675). ○ All 11 manufacturers have achieved the target value.
Centralized Refrigerators	100	2019	○ Weighted average GWP value for total category is 1.62. Refrigerant has been replaced by CO2 (1) or combination of CO2/NH3 (2). ○ All four manufactures have achieved the target value.
Aerosol Spray Cans (Dust Blower)	10	2019	○ Weighted average GWP value for total category is 2.7. ○ Propellants have been Replaced by HFO (GWP1) or DME (GWP1) ○Nineteen out of 20 manufactures have achieved the target. Remaining one has also achieved it after the target year.
Refrigeration Capacity less than 3 tons	750	2020	○ Weighted average GWP value for total category is 687.7. Refrigerant has been replaced by HFC-32 (GWP675). ○ All 11 manufacturers have achieved the target value.
Rigid Polyurethane Foam Undiluted Liquid in Residential building	100	2020	○ Weighted average GWP value for total category is 17.3. Stock solution has been replaced by HFO (GWP<2) or H2O/CO2 (GWP1) ○Seven out of eight manufactures have achieved the target. Remaining one has also achieved it after the target year.
Air-Conditioners for stores and offices (Refrigeration Capacity more than 3 tons)	750	2023	○Weighted average GWP value for total category is 683. Refrigerant has been replaced by HFC-32 (GWP675). ○ All 11 manufacturers have achieved the target value.
Auto-motive Air Conditioners for cars	150	2023	○ Weighted average GWP value for total category is 33. Refrigerant has been replaced by HFO. ○ Eight out of 12 manufactures have achieved the target. Remaining four manufacturers have also achieved it after the target year

Inspection Obliged to Equipment Users

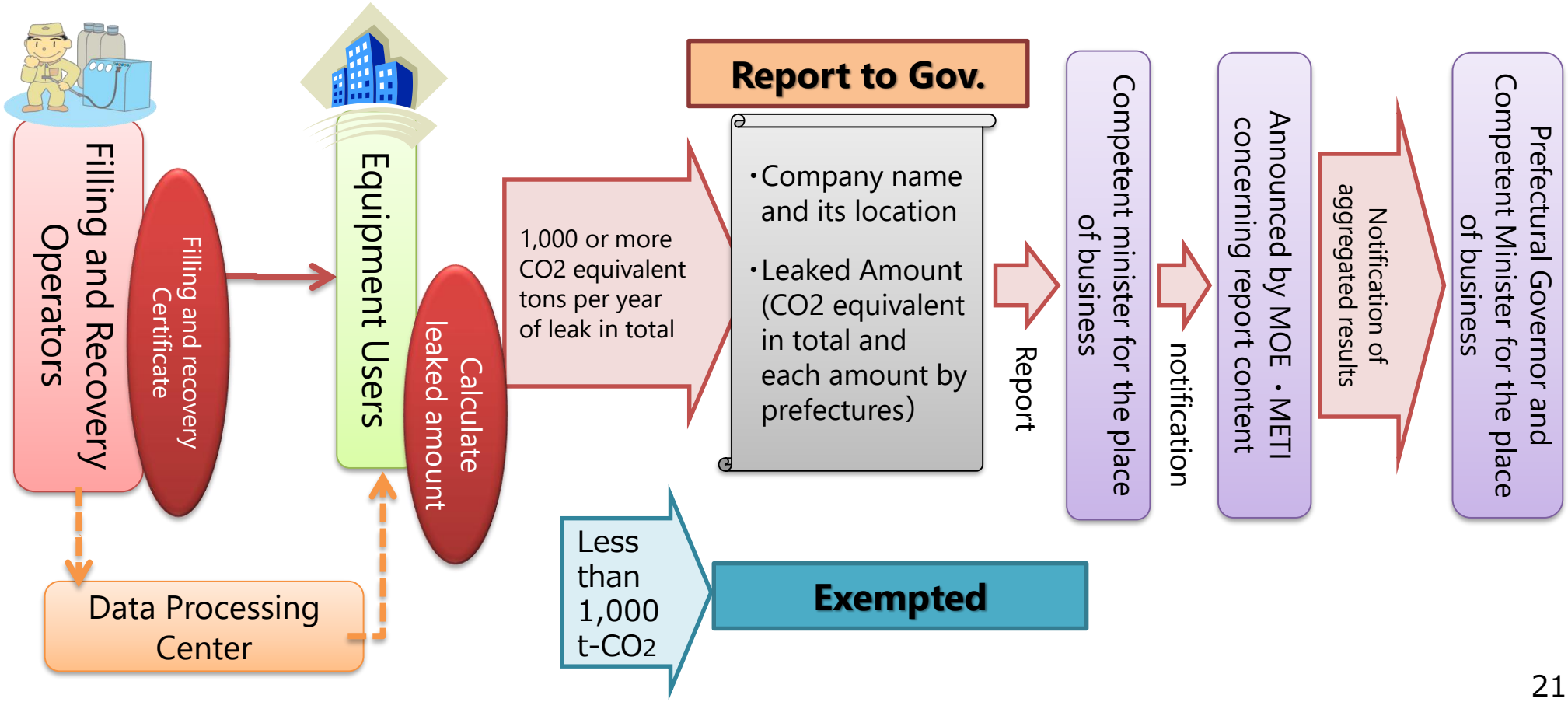
- Equipment users are required to perform simple inspections for equipment at least once every 3 months. Periodic inspections by experts should be performed for certain types of equipment as shown in the following table.
- Remote monitoring systems, which can find leakage of fluorocarbons or its possibility by detecting state value of temperature and pressure, etc. on a constant basis, have become common. In the light of this circumstances, the systems could be used as a replacement for simple inspections under the revised announcement of Fluorocarbons Emission Restraining Law since August 2022.

Equipment category	Rated output of motor used by compressor, or output of engine driving compressor	Inspection frequency
Refrigeration equipment and freezer equipment	Equipment of 7.5 kW or more	At least once per year
Air conditioners	Equipment of 50 kW or more	A least once per year
	Equipment of at least 7.5 kW but less than 50 kW	At least once every 3 months



Report on calculated amount of leaked fluorocarbons

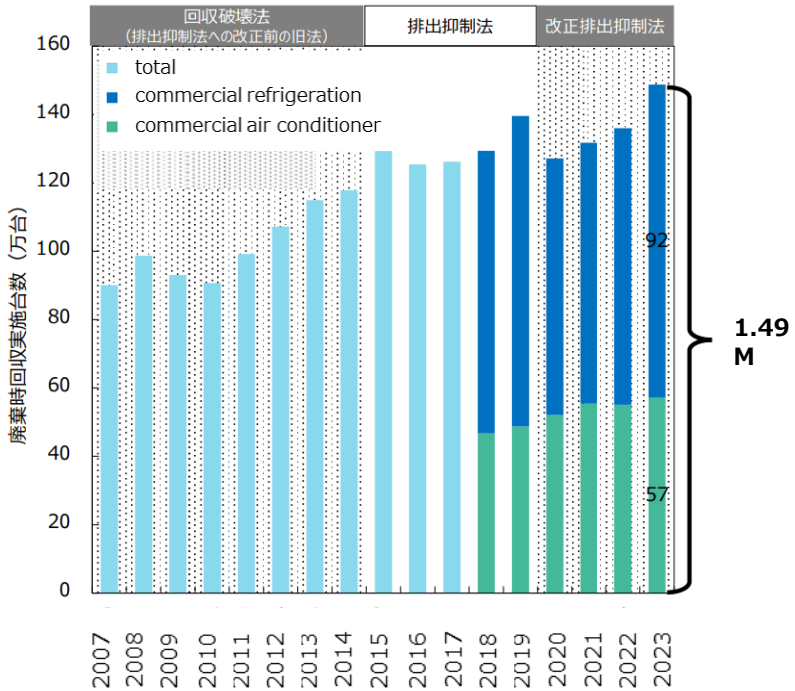
- Equipment users are required to report the leaked amounts of fluorocarbons to the government. Such requirement is subject to users who leaked 1,000 or more CO2 equivalent tonnes per year.
- The reported information is disclosed by the government for raising awareness to equipment users for proper self-management to prevent fluorocarbons leakage.



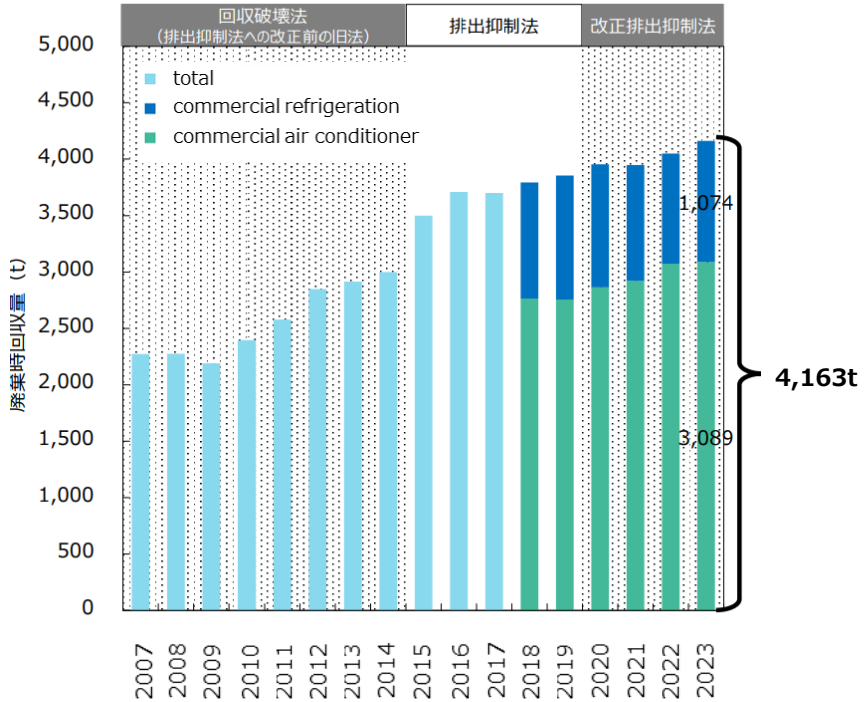
Current status of fluorocarbon recovery when disposing of equipment

- The number of units for which refrigerant was recovered when the equipment was disposed of was approximately 1.49 million, and the amount recovered was approximately 4,200 tons.
- Both the number of collected units and the amount collected are on the rise, and we will continue to promote efforts to improve the collection rate.

Number of units collected

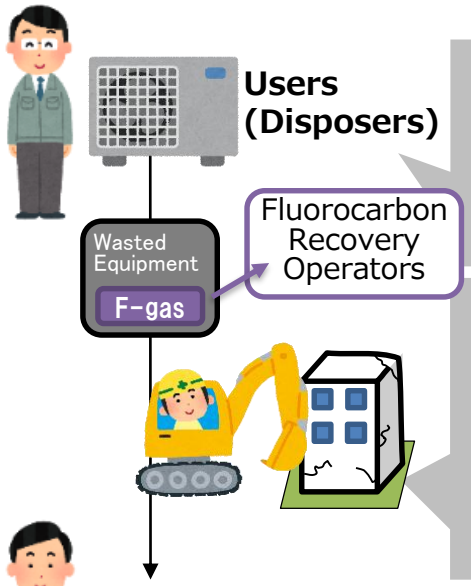


Amount of recovered refrigerant



Recovery from Wasted Equipment

- Fluorocarbon Emission Restraining Law was amended to introduce additional obligation to the equipment users and scrap/recycle operators for improving recovery of fluorocarbons from wasted equipment.
- The amendment was fully enforced on 1 April 2020.



【At the time of Equipment Disposal】

- Improve effectiveness of supervision by prefectural governments
  - **Direct punishment to users not complying with the recovery obligation**
- **Oblige users to provide the certification to prove proper recovery of fluorocarbons to scrap/recycling operators at the time of delivery of disposed equipment**

【At the time of Building Demolition】

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

【At the time of Delivery of Wasted Equipment】

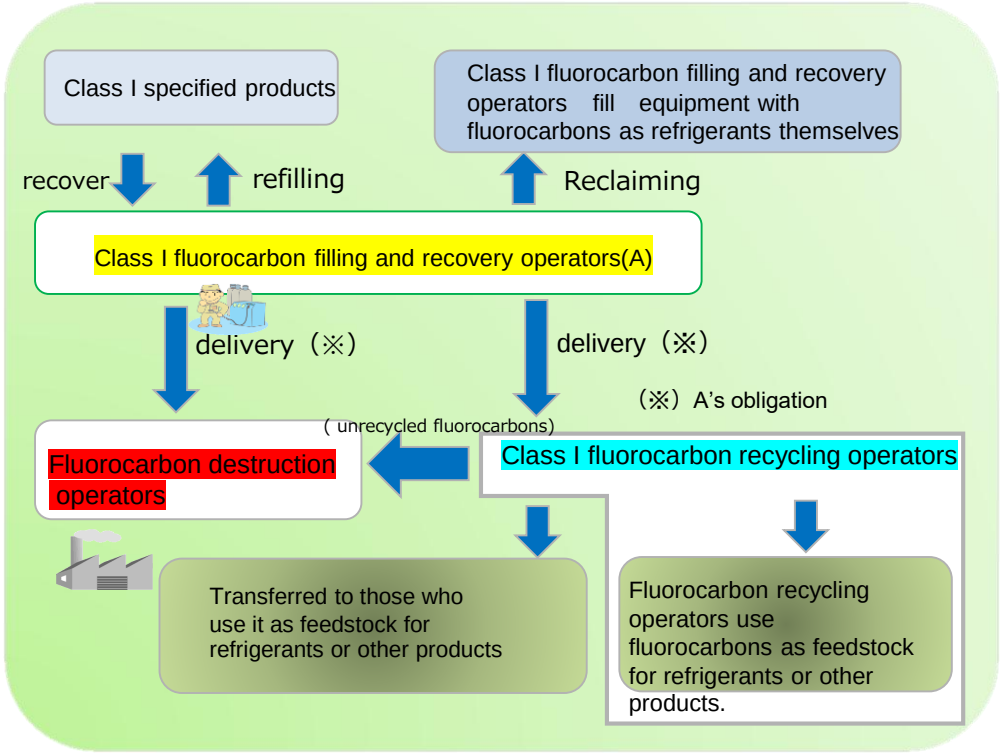
- Oblige scrap/recycling operators to check completion of fluorocarbon recovery with a certificate when they receive equipment to be scraped
- **Equipment without a certification is prohibited to receive**

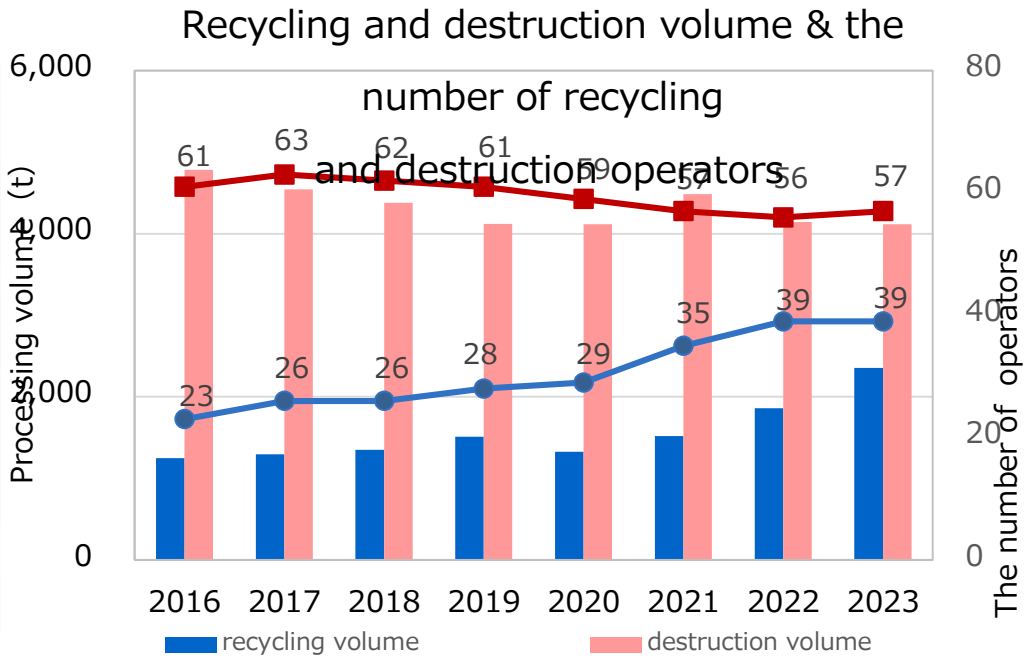
【Enhancement of Cooperation among Stakeholders】

- Tools to develop awareness prepared by the government for each relevant stakeholder
- Explicit standpoint of the council in the law

Appropriate handling by recycling and destruction operators

- Fluorocarbons recovered by Class I fluorocarbon filling and recovery operators are either recycled by Class I fluorocarbon recycling operators or destroyed by fluorocarbon destruction operators. During these operations, recycling or destruction certificates are issued to the filling and recovery operators to verify that the fluorocarbons have been recycled or destroyed.
- As of April 2025, there are 42 licensed Class Ⅰ fluorocarbon recycling businesses and 55 fluorocarbon destruction operators. Over the five years, the volume of recycled fluorocarbons has been gradually increasing while the amount being destroyed has been leveling off.





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Direction toward CN2050

Steady Implementation of Kigali Amendment

- The international commitment to the Kigali Amendment of the Montreal Protocol is steadily implemented.
- Kigali Amendment reduces Japan's HFC consumption to 15% of the base year by 2036. Further reduction is expected toward 2050.

Dissemination of “Green Refrigerants” Equipment

- Taking into account equipment durability, introduction and dissemination of “Green Refrigerants” equipment is promoted on both supply side and demand side.

Aiming for Zero Leakage from Operating Equipment

- Strong measures for avoiding leakage from the equipment already existing and being used.

Aiming for 100% Recovery Rate

- Promotion of measures to ensure full recovery of the refrigerants from all the discarded equipment.
- Development of closed circular system for refrigerants recovery, recycle, and reuse, along with the proper implementation of the recycling/destruction system based on the law. Such system could contribute to prepare for the forecasted shortage of replenishment refrigerants.

Awareness Raising and International Cooperation

- Raising awareness and promoting national understanding to advance such actions toward CN2050.
- Supporting to strengthen the life-cycle management of fluorocarbons world-wide through the active promotion of the Initiative of Fluorocarbons Life Cycle Management (international activities initiated by Japan).
- International dissemination of Japan’s advantages such as fluorocarbons management scheme and refrigeration technologies.

Thank you

Ozone Layer Protection Policies (METI)
https://www.meti.go.jp/policy/chemical_management/ozone/index.html

Fluorocarbons Emission Restraining Law Portal Site (MOE)
http://www.env.go.jp/earth/furon/