

The Trend of Natural Refrigerants in Japan

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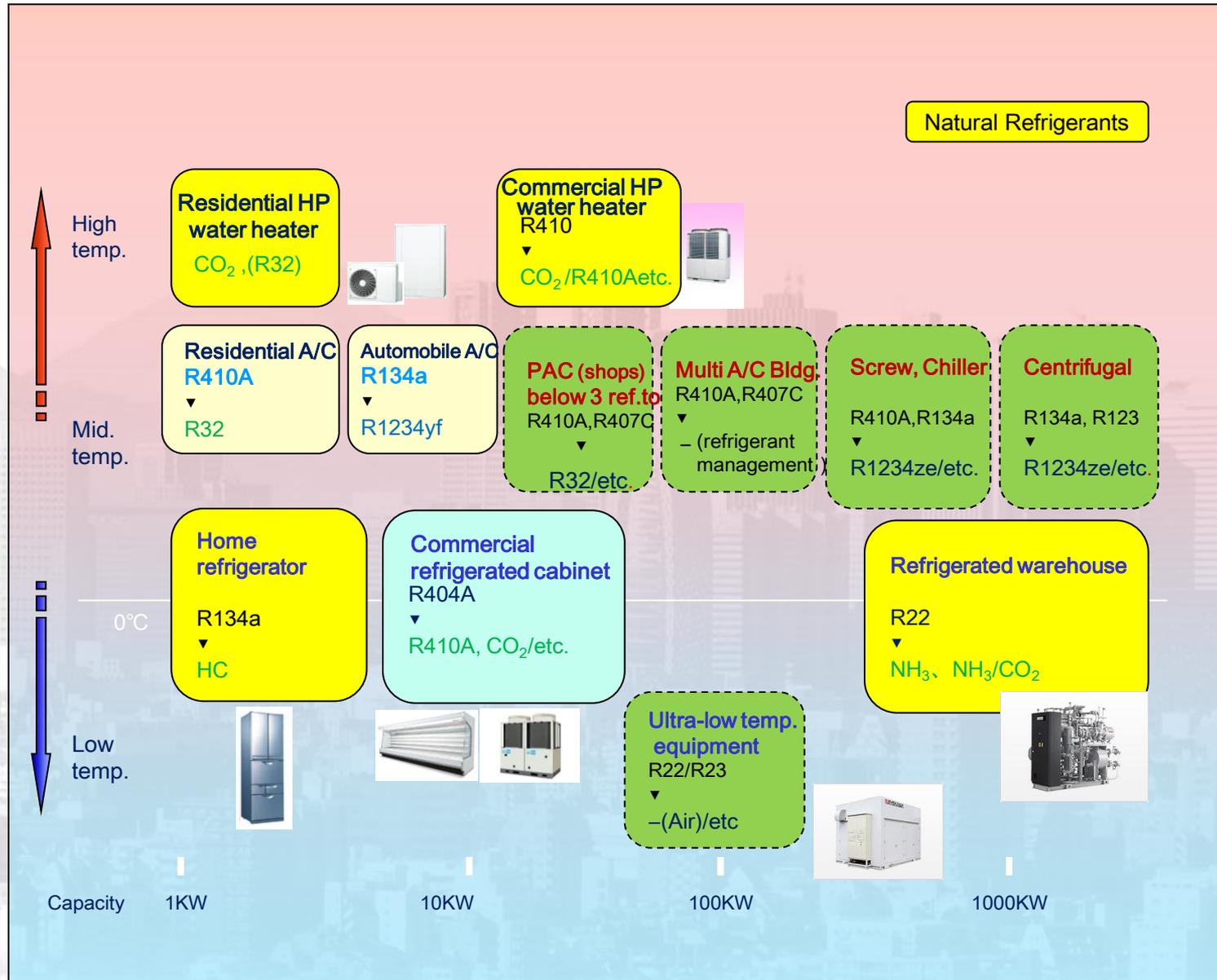
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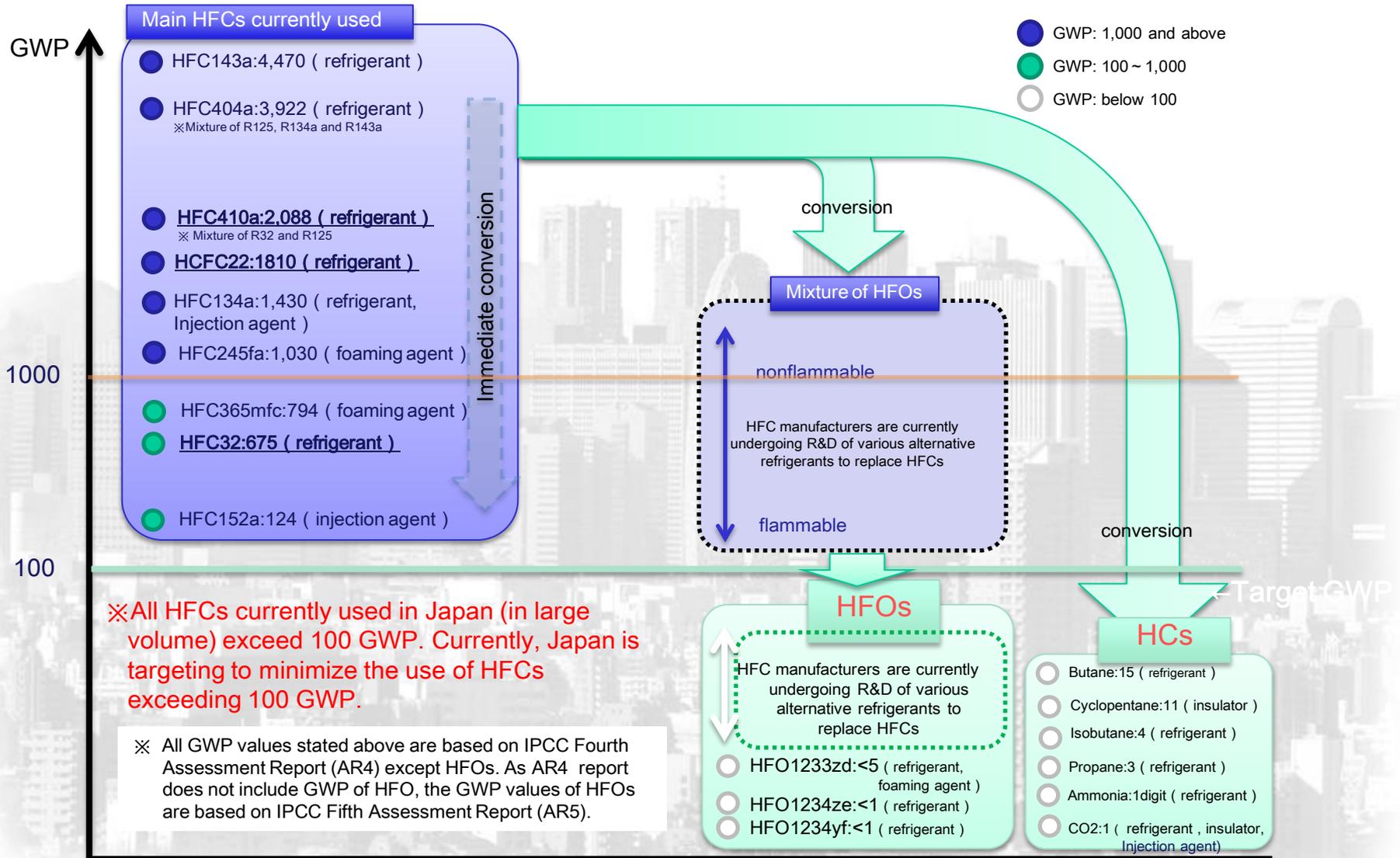
1. Market Trend in Japan

Product Category	Number of Units in 2015 (in thousands)	Y/Y Ratio (%)
Residential air conditioners	8104.2	95.3
Commercial air conditioners	795.4	95.1
Residential heat pump water heaters	406.7	93.3
Gas engine-driven air conditioners	30.0	95.7
Water chilling units	12.7	97.9
Air to air heat exchangers	119.2	90.5
Commercial refrigerated cabinets	300.8	87.8
Condensing units	88.9	100.5
Refrigeration units	28.3	98.9

2. Possible Alternative Refrigerants by Application



3. Target GWPs of Alternative Refrigerants



4. Trend of Natural Refrigerants in Japan

1. Japanese government support the acceleration of R&D of natural refrigerants (government subsidies to support the projects)
2. CO₂ refrigerants training programs for installers by HFC manufacturers
3. R&D of alternative refrigerants by manufacturers
4. Research of overseas market trends

5. JRAIA's Vision and Action Plan for Environment Conservation

ENERGY SAVING EQUIPMENTS

Minimize CO₂ Emission

Top Runner Program

MINIMIZE EMISSION OF REFRIGERANTS

- Support the recovery of refrigerants
- Measures to minimize the leakage (proper management of refrigerants)
- Reduction of amount charged into equipment

Fluorocarbon Recovery & Destruction Act ⇒ Revised in 2015 to Act on Rational Use and Proper Management of Fluorocarbons

Home Appliances Recycling Law

End-of-Life Vehicle Recycling Law

ALTERNATIVE REFRIGERANTS

Accelerate the shift to new refrigerants

- Use of non-HFC refrigerants
- Research of low-GWP refrigerants and NR

6. Characteristics of Natural Refrigerants (NR)

NR	Characteristics	
	Pros	Cons
CO ₂	High-efficiency on high temperature environment (HP water) GWP=1 Non-toxic, odorless, non-flammable	High operating pressure Low critical temperature (31.1°C) resulting in lower thermal efficiency in case of high outdoor temperature
NH ₃	High-efficiency (only requires small quantity) GWP=less than 1 A good performance can be achieved in combination with other refrigerants	Toxic, odor
HC	Applications are already in the market for household refrigerators with small capacity GWP = less than 10	Higher Flammability→ Subject to legal restrictions for the construction of the building using the amount exceeding the specified limit
H ₂ O	Harmless, odorless, non-flammable	Efficiency is not very high

7. Requirements for the Alternative Refrigerants

3Es+S

Environment
Performance

- Ozone Depletion Potential =0
- Low GWP

Economic
Feasibility

- Reasonable cost
- Acceptable level in developing countries

Energy
Efficiency

- Superior LCCP value
- Similar performance at high load cooling



Safety

- Low toxicity
- Low risk of flammability

8. Safety Issue

JRAIA continues to call on the industry for the safe and appropriate use of refrigerants;

- Warning notice for the appropriate use of refrigerants
- Statement to be issued for the use of right refrigerants

JRAIA's warning notice for the appropriate use of refrigerants (in Japanese only)

警告!!
指定以外の冷媒を使用しない!!

冷凍空調機器は、その機種に封入する冷媒が指定されています。
指定された冷媒と異なる冷媒を冷凍空調機器に封入すると、機械的不具合・誤作動・故障の原因となり、場合によっては安全性確保に重大な障害をもたらすおそれがあります。

特に、プロパンなどハイドカーボン(HC)系を成分とした冷媒は漏れ等が生じた際、強い燃焼性があり、火災や爆発など重大災害に至るおそれがあり**大変危険**です。

封入冷媒は、機器付属の説明書あるいは機器本体の銘板等に記載されています。**必ず指定された冷媒を封入してください。**
それ以外の冷媒を封入した場合の故障・誤作動などの不具合や事故などについては、製造メーカーやそれら冷媒の封入作業に関与していない設置業者は一切その責任を負いません。

機器本体の記載例

フロン排出抑制法 第1種特定製品

- フロン類をみだりに大気中に放出することは禁じられています。
- この製品を廃棄・整備する場合には、フロン類の回収が必要です。
- フロン類の回収及び廃棄並びに冷媒の数量の二酸化炭素換算値、地球温暖化係数を記載したラベルを貼付してください。

種類	冷媒番号	地球温暖化係数	数量 (kg)	二酸化炭素換算値 (kg)
HFC	R410A	2090	3.5	7315

一般社団法人 日本冷凍空調工業会
一般社団法人 日本冷凍空調設備工事業者会

English Statement to be issued for the use of right refrigerants

STATEMENT ON THE USE OF RIGHT REFRIGERANTS (TENTATIVE VER.)

We, the following industry associations

- 1. REPRESENTING** manufacturers who are committed to a healthful environment and who produce more than 90% of the world's heating and cooling equipment that is a cornerstone of modern society by providing comfortable, productive, and clean indoor environments, refrigeration for the global food chain, and safe and readily available medicines;
- 2. RECOGNISE** that equipment manufacturers choose refrigerants as part of overall equipment design and that the choice of appropriate refrigerant can vary by application. We further understand that appropriate refrigerant choice needs to balance a broad range of issues, including: performance, energy efficiency, safety, longevity of equipment, ease of use, cost, environmental characteristics, and other attributes;
- 3. NOTE WITH GREAT CONCERN** that there are increased safety and environmental risks associated with the use of refrigerants in refrigeration and air-conditioning equipment that are not specifically designed for their use.
- 4. CALL** on the service industry to consider the above facts and to only use any refrigerant in equipment where approved by the original equipment manufacturer or has been subject to and technically approved through risk assessment in accordance with international and local standards;
- 5. ENCOURAGE** governments to work with industry to make the entire HVACR supply chain and the public aware of these cautions and if necessary to regulate and develop enforcement regimes.

Thank you for your attention



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natural refrigerants

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