Global Market Trends for Natural Refrigerants in commercial refrigeration

Refrigeration in the supermarket sector

Taastrup, 9 November 2017

Alvaro de Oña, COO, shecco group

SHECCO - OVERVIEW

shecco Base

market accelerator for climate-friendly technologies

offices: brussels, new york, tokyo, berlin

focus is on the HVAC&R industry & natural refrigerants

CO_2, NH_3, HC, H_2O, Air

150+ clients

reach 30,000+ individuals through our communication network

SHECCO - OVERVIEW

shecco Base

global market accelerator
for natural refrigerant based technologies

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R744.com		guide shecco publications
AMMONIA21		THE NATURAL VOICE
HYDROCARBONS21		THE CIRCLE
Webinar Wednesday		Government Projects
		SUPERSMART

INTERNATIONAL DEVELOPMENTS

01

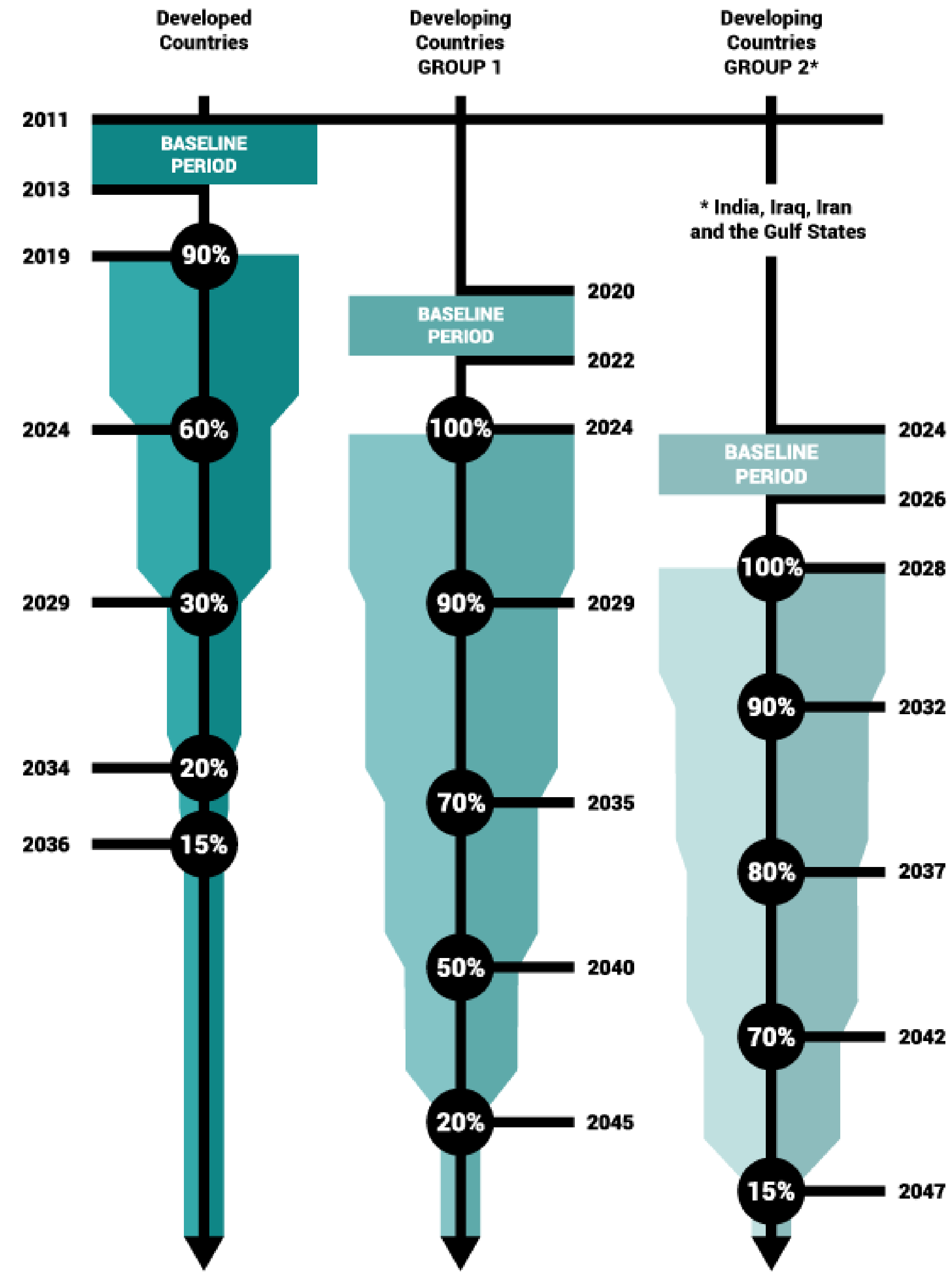
KIGALI AMENDMENT: SCHEDULE

Global phase-down of HFCs by 85% by late 2040s - first reductions by developed countries as of 2019, by most developing countries as of 2024

- Phase-down schedules by groups of countries under Montreal Protocol
- Based on baseline period,
- Entry into force: 1 January 2019 if 20 or more countries ratify it (so far 8 countries ratified)
- Top priorities: standards (initiated by China), access to finance, exemptions

Next key meeting

20-24 Nov: 29th Meeting of the Parties of the Montreal Protocol (Montreal, Canada)



STANDARDS: KEY DEBATE FOR HYDROCARBONS

IEC: 9 October in Vladivostok, Russia: Agreement to advance the draft amendment of standard IEC 60335-2-89 for commercial refrigeration, to raise the charge limit of propane from 150g to 500g.

- The final version of a draft amendment by December 2017.
- Charge limit raised for all safety classes of flammable refrigerants, but with different limits.
- A new IEC standard would influence the adoption of the same standards at national level across the world

Next steps:

- The Committee Draft for Vote (CDV) will be circulated for votes & comments by all national committees within IEC in December 2017 earliest.
- Vote on the CDV expected in the first half of 2018 (provided that more than 2/3 of the committee members vote in favour).
- Final vote phase by the **end of 2018** following the SC61C committee meeting in Busan, South Korea in October 2018.
- Final amended standard expected beginning of 2019 - Potentially opening up further opportunities to hydrocarbons globally

POLICY TRENDS
EUROPE

02

EU F-GAS REGULATION

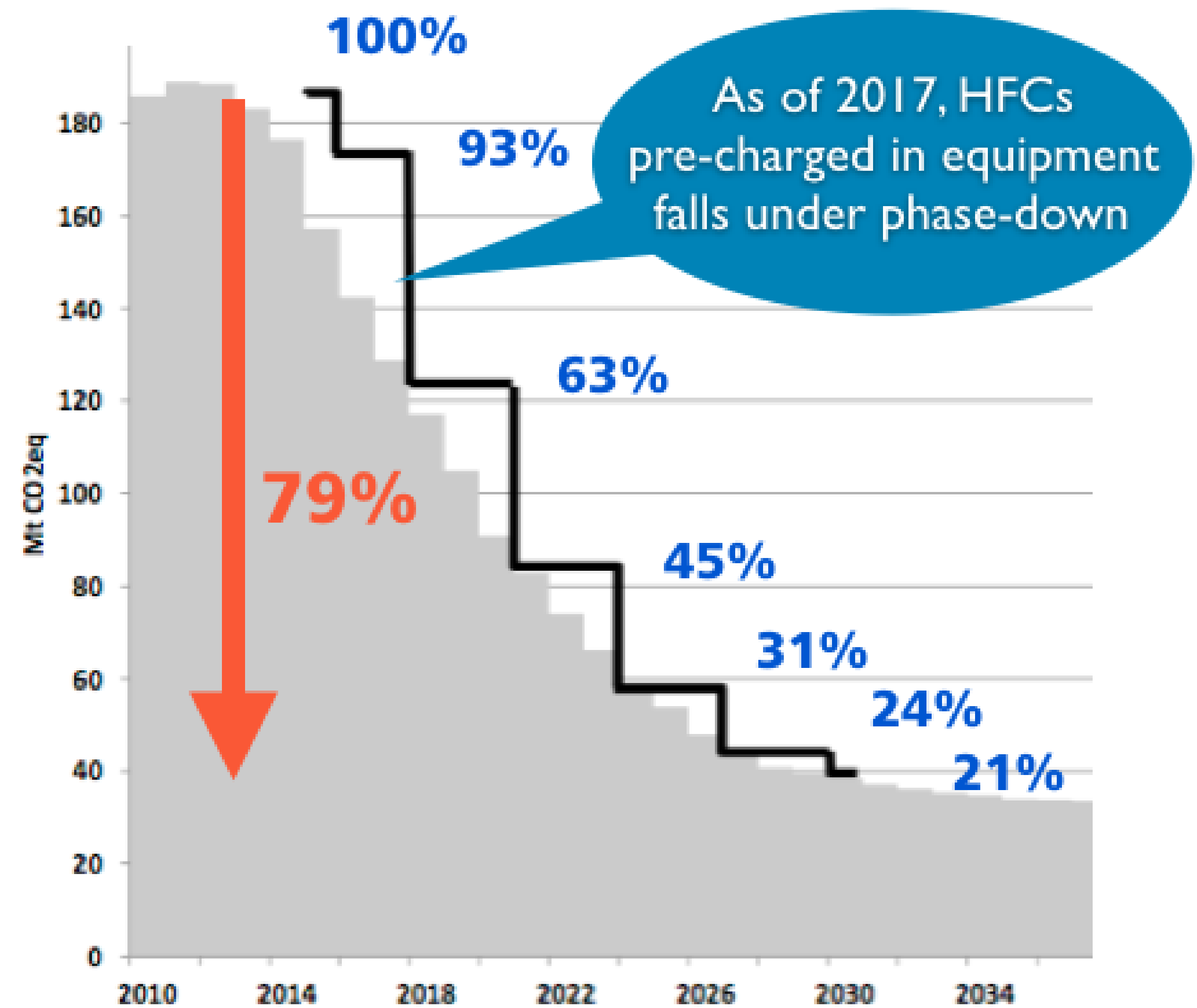
2016: 7% cut in HFC quotas

2017: HFCs pre-charged in equipment covered under phase-down
Significant increase in HFC prices:

R404A and R507A: 225% increase since April 2017;
R134a and R410A: +50% since 1 April

2018-2020: 37% cut in HFC-quotas - further price increases of HFCs expected

NO negative impact on manufacturers & buyers of natural refrigerant-based equipment



EUROPE: EU F-GAS REGULATION

- F-Gas Regulation sends a clear signal for low-GWP refrigerants in light commercial refrigeration
- 2022 - ban on HFCs (GWP > 150) in hermetically sealed commercial refrigeration
- **Standards** - European Commission (EC) report (2016) revealed that standards at national and EU level are an important barrier to wider uptake of flammable refrigerants
  - EU level - EC standardisation request to the European Committee for standardisation (CEN), to work on developing standard parameters for flammable refrigerants
  - National level - France, Spain, Italy reported a number of national decrees that restrict use of flammable refrigerants

POLICY TRENDS
NORTH AMERICA

03

US: EPA SNAP PROGRAM

August 2017: U.S. Court of Appeals of Columbia - EPA cannot require companies to replace HFCs designated for HVAC&R equipment or other applications with low-GWP substances under the SNAP program

- long-term effects of this decision as well as the reaction by the EPA remain to be seen

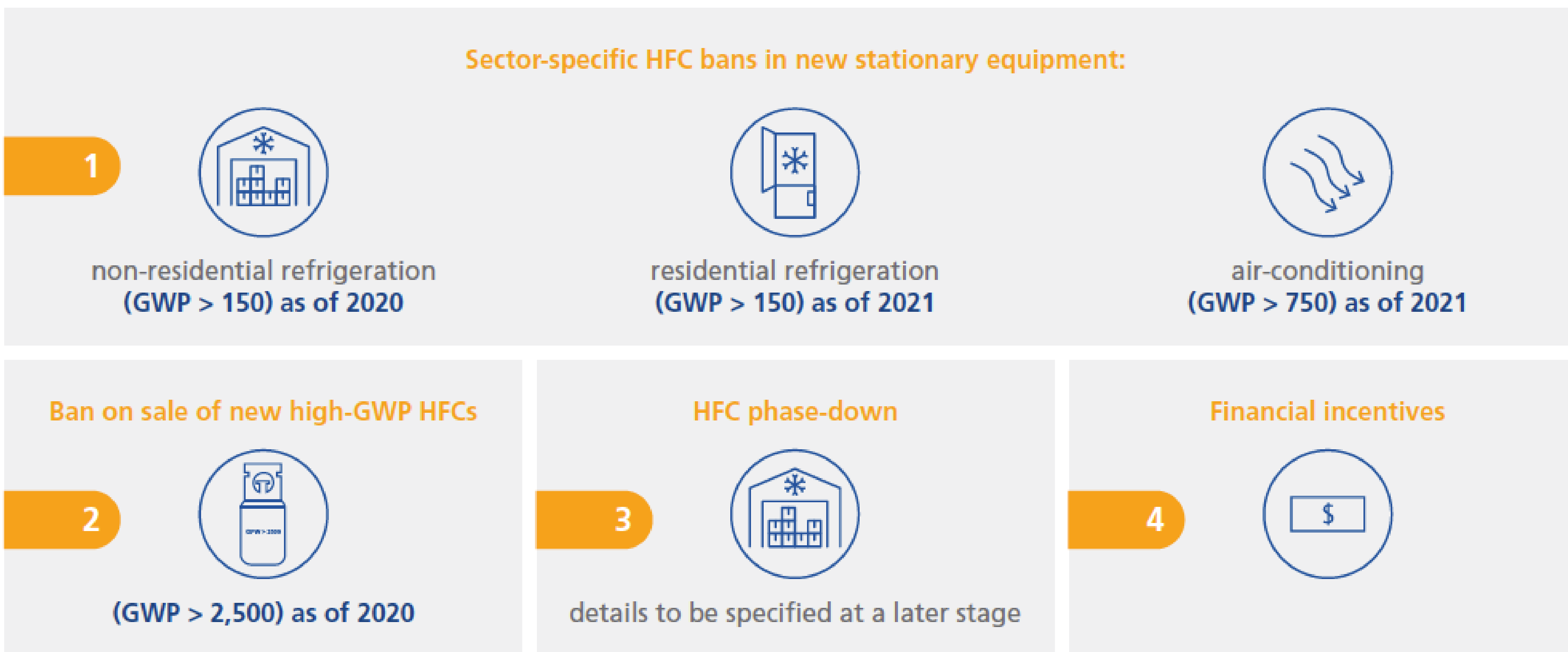
Background:

- Hydrocarbons listed as alternatives in number of applications, including commercial refrigeration
- September 2016 SNAP published a rule to prohibit the use of certain high GWP fluorinated gases (R404A, R410A, R134a, and R407C).

US: CALIFORNIA LEADING THE WAY

Short-Lived Climate Pollutant (SLCP) Reduction Strategy - approved on 23 March 2017

- Aims to reduce HFCs by 25% below business-as-usual emissions by 2020; by 40% by 2030;
- CARB currently conducting a Scientific Assessment to investigate effective measures for low-GWP alternatives. FINANCE support available, but Industry not requesting it for HVAC&R.
- CARB consulting on the potential adoption into state regulations of SNAP Rule prohibitions of HFCs in stationary refrigeration and air conditioning.



CANADA: TARGETING HFC PHASE-DOWN

- Canada implementing HFC phase-down until 2030, including reporting obligations
- Plans to introduce nation wide carbon pricing in 2018
- Sector specific bans on high-GWP HFCs

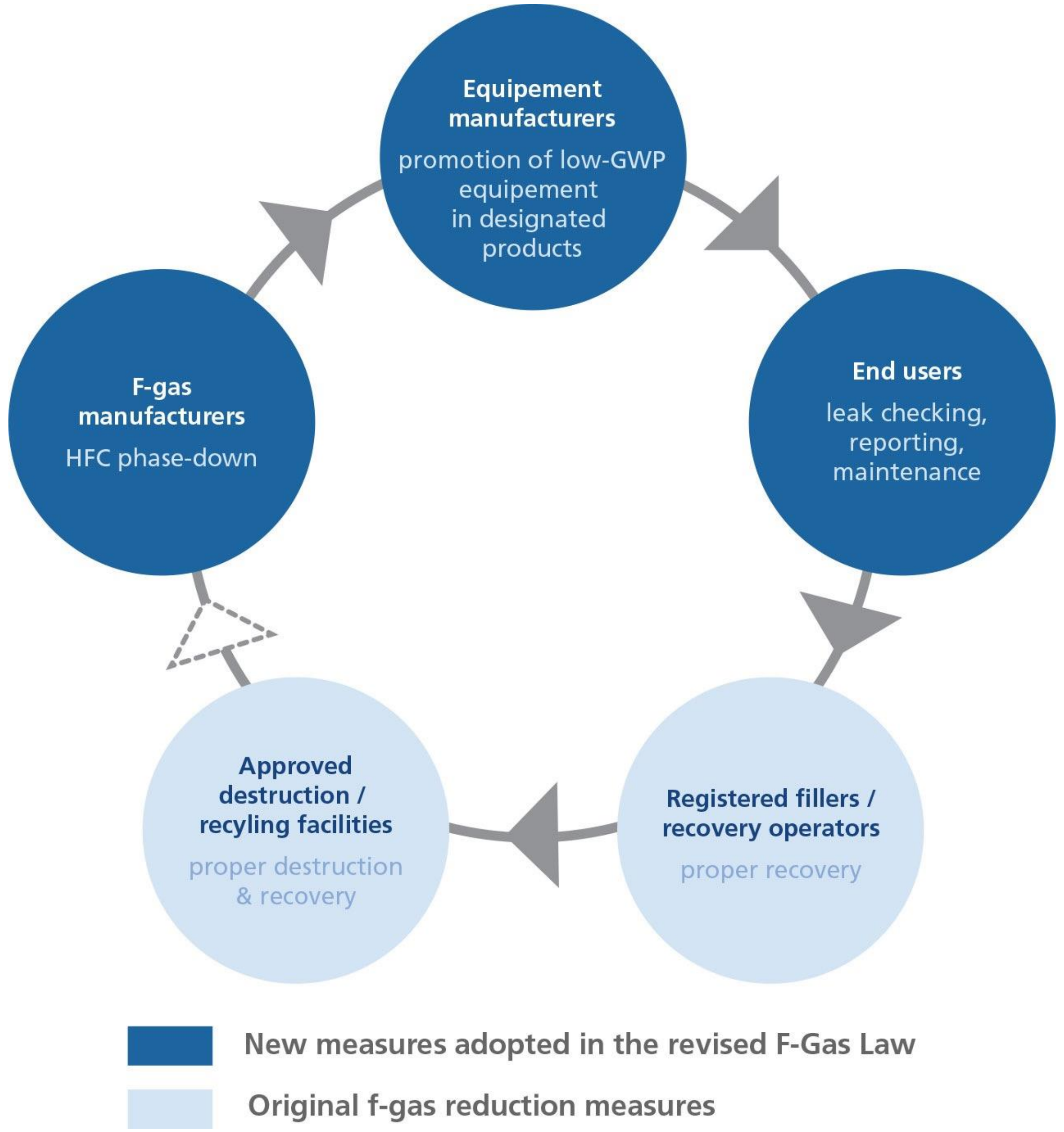
Product	Use	Date	Maximum GWP
Stand-alone medium-temperature refrigeration	commercial / industrial	1 Jan 2020	700
	residential	1 Jan 2025	150
Stand-alone low-temperature refrigeration	commercial / industrial	1 Jan 2020	1,500
	residential	1 Jan 2025	150
Centralised refrigeration (capacity> 30 kW)	commercial / industrial	1 Jan 2020	1,500
Condensing unit (capacity ≤ 20 kW)	commercial / industrial	1 Jan 2020	2,200
Chillers	commercial / industrial	1 Jan 2025	700
Mobile refrigeration	commercial / industrial	1 Jan 2025	2,200

POLICY TRENDS
JAPAN

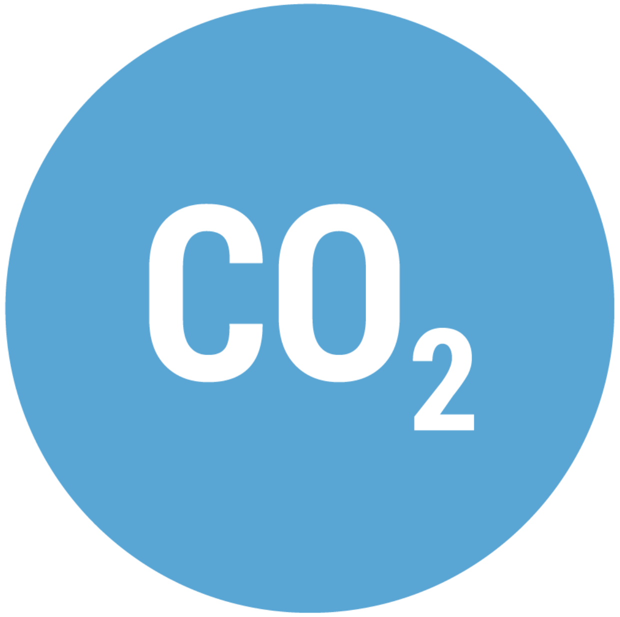
04

JAPAN: F-GAS LAW

- Effective as of April 2015;
- Targets the entire life cycle of f-gases, from production to destruction;
- Reduced f-gas leakage from commercial equipment: periodical checks, maintenance, reporting etc.; proper refill and recovery; obligation of destruction;
- Promotion of low-GWP / non f-gases alternatives for designated products, incl. condensing units & refrigeration units > 1.5kW (target of average GWP 1500 by 2025).



JAPAN: HIGH PRESSURE GAS SAFETY ACT



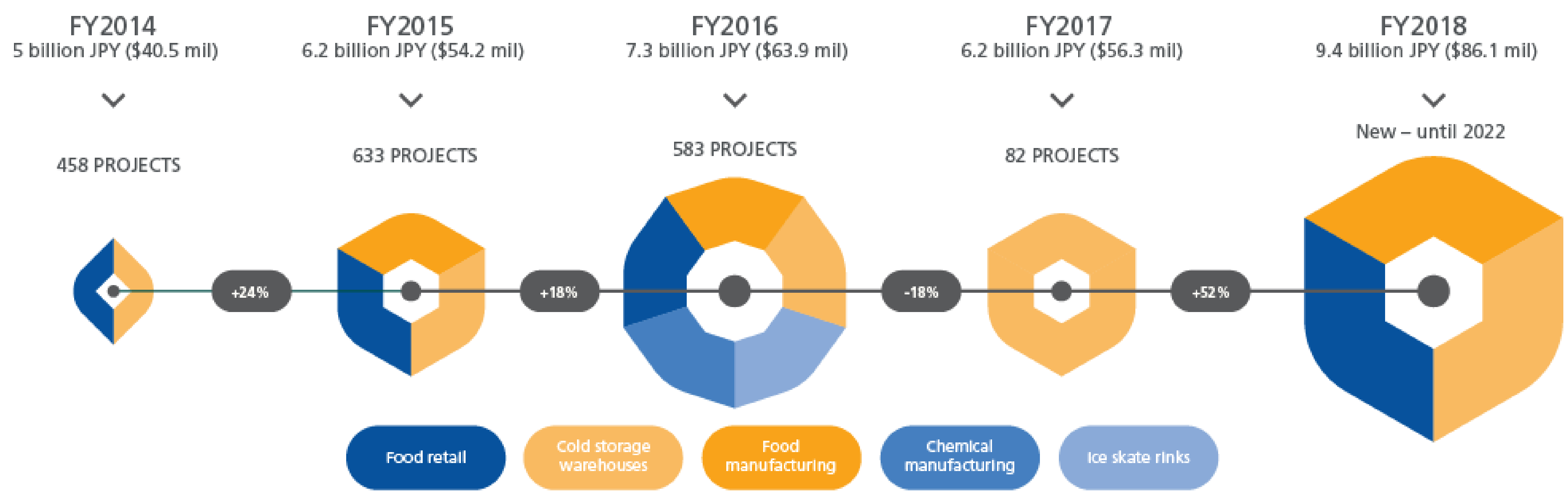
- July 2017: CO_2 reclassified under High Pressure Gas Safety Act
- move from the strictest level of Group 3 to the least restricted level of Group 1
- What does it mean?
  - equipment under 20 tons does not require any government notification or permission (previously under 3 tons);

= OPPORTUNITY for larger CO_2 refrigeration (commercial and industrial) systems to be introduced in the market, creating more options for end users

JAPAN: SUBSIDIES CHANGING FOCUS

FY2018 (9.4 billion JPY - $86.1 mil) in food retail, food manufacturing and cold storage sectors

By 2022 (end of subsidy scheme) - achieve cost parity with conventional f-gas equipment, and accelerate the uptake of natural refrigerant-based technology



POLICY TRENDS
AUSTRALIA & NEW ZEALAND

05

AUSTRALIA HFC PHASE-DOWN PLAN

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- March 2017: New f-gas legislation introduced in Australia amending the Ozone Protection and Synthetic Greenhouse Gas Management (OPSGGM) Act by adding an HFC phase-down plan

- A statutory phase-down of HFC imports will be implemented, commencing January 2018, and will reduce HFC emissions by 85% by 2036

- Compared to Kigali Amendment requirements: lower baseline (reflecting Australia’s current demand), & more frequent reduction steps

Australian Government

Department of the Environment and Energy

NEW ZEALAND HFC PHASE-DOWN PLAN

New Zealand HFC phase-down plan:

- HFC import licensing system;
- Permit system for the exportation of HFCs and imports of recycled HFCs;
- Support programs for alternative refrigerants (open for consultation).

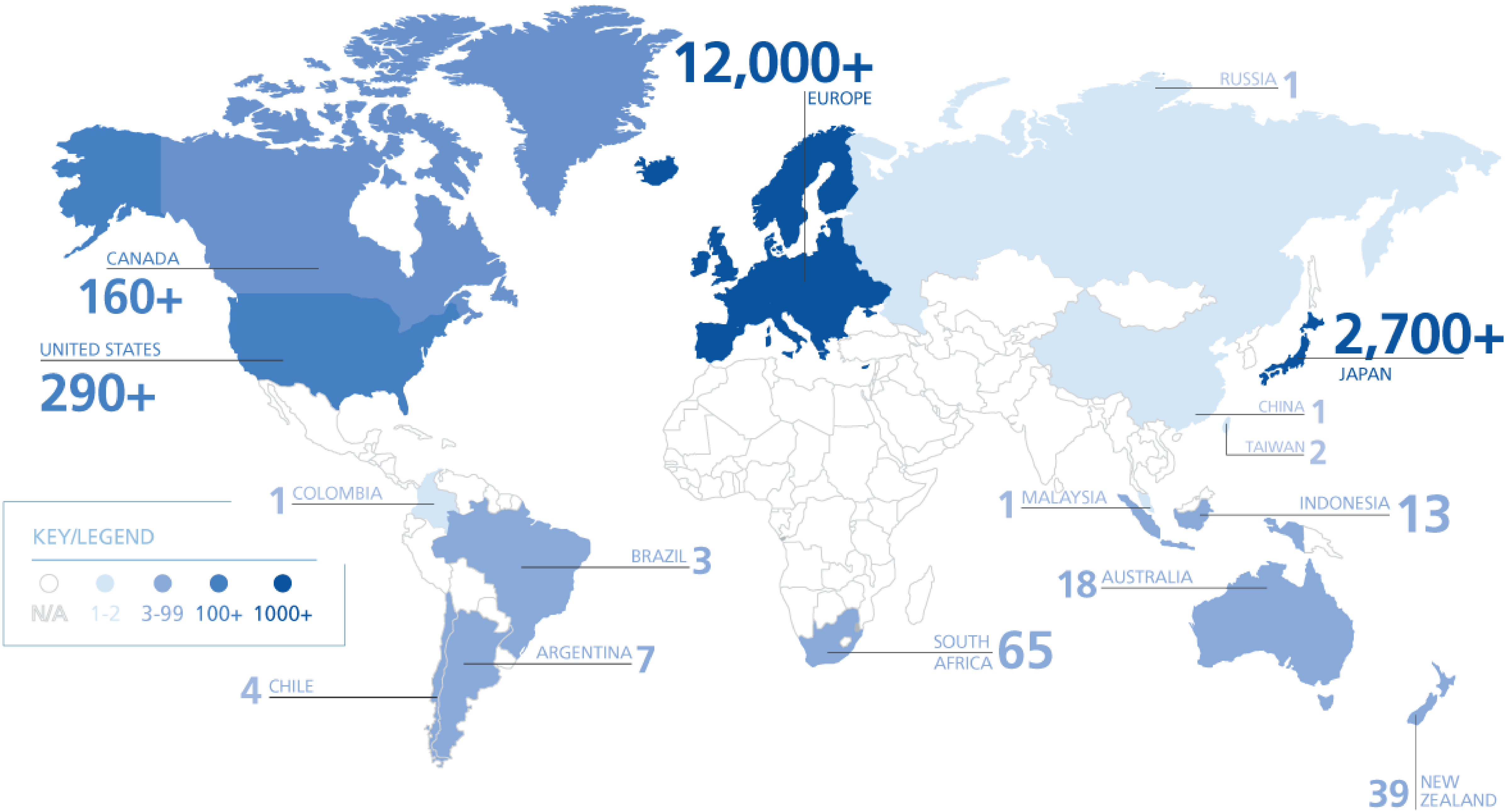
Targets: reduce HFC consumption by +80% and HFC imports from around 1,340 KtCO2 to < 260 by 2036.

Expected to come into force by January 1, 2019.

MARKET TRENDS
COMMERCIAL REFRIGERATION

01

CO_2 TC STORES GROWING GLOBALLY (OCT 2017)



CO_2 TC MAJOR MARKETS: GROWTH TRENDS

	2015	2017	Growth
Europe	5,500	12,000	118%
USA	52	290	458%
Canada	139	160	15%
Japan	1,500	2,700	80%

Other regional markets also emerging as a result of individual food retailers' efforts

KEY TREND: CO_2 BECOMING MAINSTREAM IN RETAIL

Large food retail groups = CO_2 Transcritical systems becoming the norm in Europe, N. America, Japan.

Efficiency and reliability are increasing, and prices are going down.

Case Study: Aldi Süd reaches 1000th installation:

- Strategic decision in 2010: Exclusive focus on natural refrigerants
- Now: Over 54% of all Aldi Süd's stores globally are running on CO_2

Source: r744.com/articles/7423/aldi_sud_proud_to_install_1_000th_co2_system

CO_2 IN CHINA (JULY 2017 UPDATE)

- First major CO_2 transcritical store to open January 2018
- Currently 40 subcritical CO_2 supermarkets in China (HFC/CO_2 cascades)
- Majority operated by Metro China, first ever installed by Tesco
- Market opening up to natural refrigerants. Potential identified in:
    - CO_2 in commercial and industrial; heat pumps

EUROPE: KEY TRENDS & INSIGHTS (EUROSHOP 2017)

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- On-the-spot survey to 33 companies, including major players of the sector
- Ejectors, parallel compression and waterloop systems identified to be the main technology trends
- Approximately 15-20% increase in production of natural refrigerant systems expected for the period 2017-2018
- R290 dominating plug-ins, showing the greatest potential
- Even higher growth expected by 2020 and beyond, with a few companies claiming that they will be ready to have their entire production moving to only natural refrigerants
- Regulation and mainly customer demand are the reasons for the expectations, especially for Europe

SUPERSMART PROJECT

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Objectives:

- Remove non-technological barriers
- Increase market uptake of efficient heating and cooling technology

Activities:

- Trainings at conferences
- Preparation of EU Ecolabel for food retail stores

Retailer Benefits:

- Free of charge trainings at premises
- High quality reports available for free

- **Horizon 2020** Program
- Start: 1.2.2016
- Duration: 36 months
- **9 project partners** from all over Europe
- 8 **reports** about **efficient food retail stores** available

SUPERSMART

www.supersmart-supermarket.info

KEY TREND: CO_2 RACK SYSTEM

Highly competitive evolving market for suppliers providing CO_2 solutions

KEY TREND: CONDENSING UNITS / SMALLER SYSTEMS

Japan - leader in CO_2 condensing units for smaller store formats

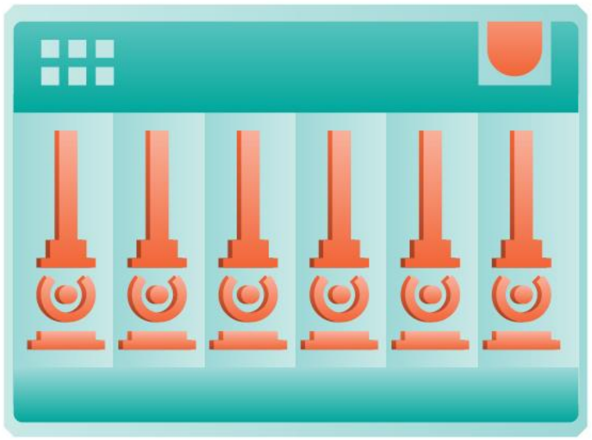
Europe traditionally working with large capacity CO_2 racks, but several manufacturers introduced small systems

Competition increasing: more efficiency, lower prices

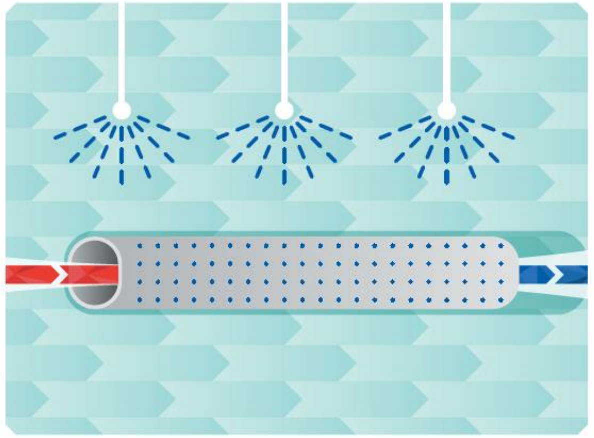
KEY TREND: SMALLER NH_3/CO_2 SYSTEMS

Growing line up of small size NH_3/CO_2 systems – potential to serve supermarkets?

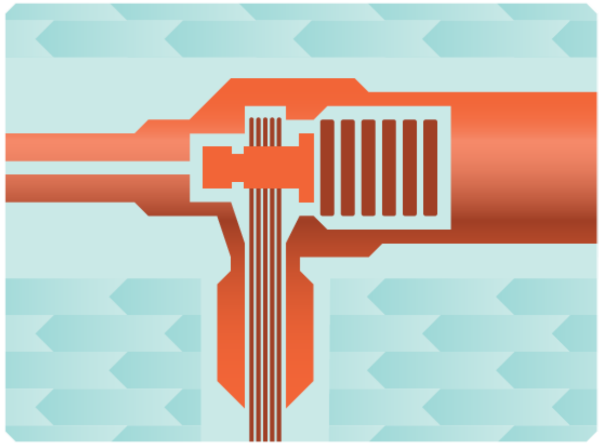
KEY TREND: CO2 SOLUTIONS FOR EFFICIENCY IN WARM CLIMATES



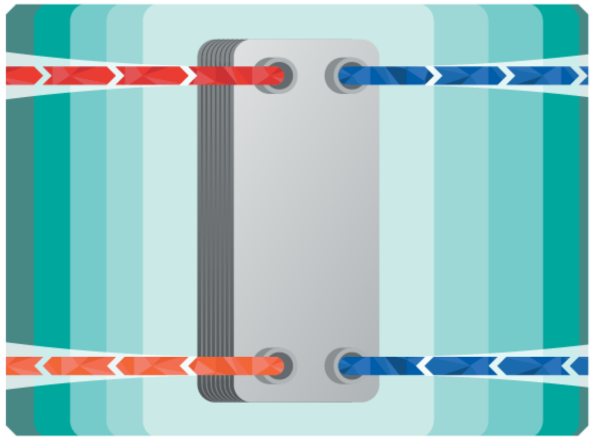
Parallel Compression



Adiabatic Cooling



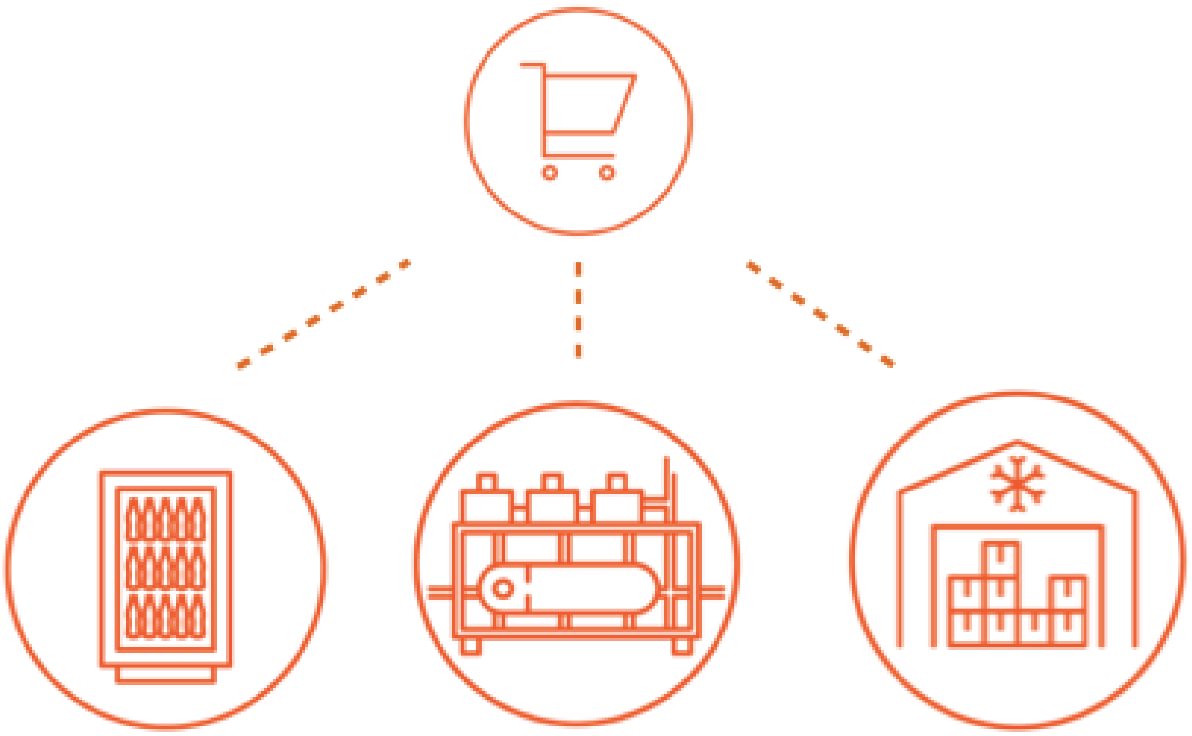
Ejector



Sub coolers

KEY TREND: DISSIPATING BOUNDARIES

Limits between “light-commercial” and “commercial” refrigeration become vague: HC pushing into larger store formats, and CO_2-based systems into smaller formats



= internal competition between different NR systems has increased

MARKET TRENDS
LIGHT - COMMERCIAL REFRIGERATION

02

CONSUMER BRANDS CHOOSING NATURAL REFRIGERANTS

5.5 million units using natural refrigerants (HC & CO_2) collectively installed

=> 33 million tonnes of avoided CO_2 (equivalent emissions of more than 6.7 million passenger cars over one year)

Increasing number of consumer brands choosing HCs for their point of sale equipment - often targeting global procurement 100%

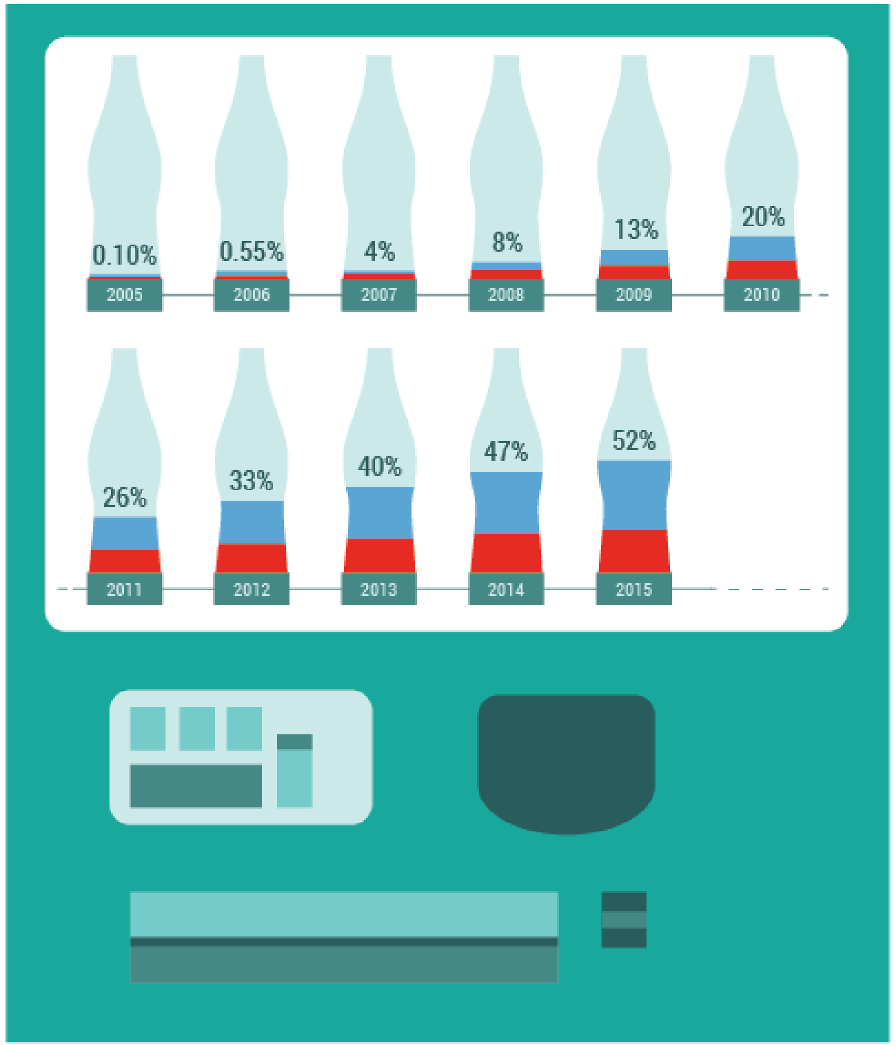
HC VENDING MACHINES IN JAPAN

1.35+ million beverage vending machines in Japan use either hydrocarbons or CO_2 - world's highest number per capita

550,000+ HC (R600a) vending machines in the market

natural refrigerants make up over 50% of the market

from 0.1% to 52% market share in just 10 years



HYDROCARBONS GROWTH - AHT

Plug-in Units in Supermarkets with R290: A reality today

Market estimate by early 2017 - Figures reported by AHT (market leader):

1,500,000+ units worldwide

- over 300,000+ units manufactured per year
- Over 1000 units in the US in one year

KEY CHALLENGES

03

EUROPE: ON TRACK… BUT PROGRESS IS SLOW

Deadlines for F-Gas Regulation approaching fast for retail: only 10-20% of total stores in compliance.

Urgent progress in:

- Capacity building
- Solutions for existing stores (esp. in Southern Europe)
- Non market barriers: standards, Training, etc.

INTERNATIONAL: BUT PROGRESS IS SLOW

Kigali sends a powerful message: HFCs on their way out.

Challenges:

- Finance to developing countries
- Technology transfer
- Training

CHINA: WHAT WAY AHEAD?

Competition in NR area to increase… but setting the foundations is still needed

CONCLUDING REMARKS

- High GWP refrigerants on their way out globally = opportunity for natural refrigerants
- CO_2 transcritical is becoming a standard in commercial refrigeration in Europe, N. America, Japan
- Hydrocarbons - higher charge limits under revised standard could open up new market opportunities
- Competition between different types of natural refrigerant-based systems expected to intensify - competition to increase performance & reduce cost

SHECCO USEFUL LINKS

Industry Platforms:

www.hydrocarbons21.com

www.R744.com

www.ammonia21.com

shecco Publications, incl.

GUIDEs

http://publications.shecco.com

Accelerate Magazines:

www.accelerateEU.com/

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www.accelerateAUNZ.com/

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ATMOsphere conferences:

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www.webinarwednesday.net

The Natural Voice

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