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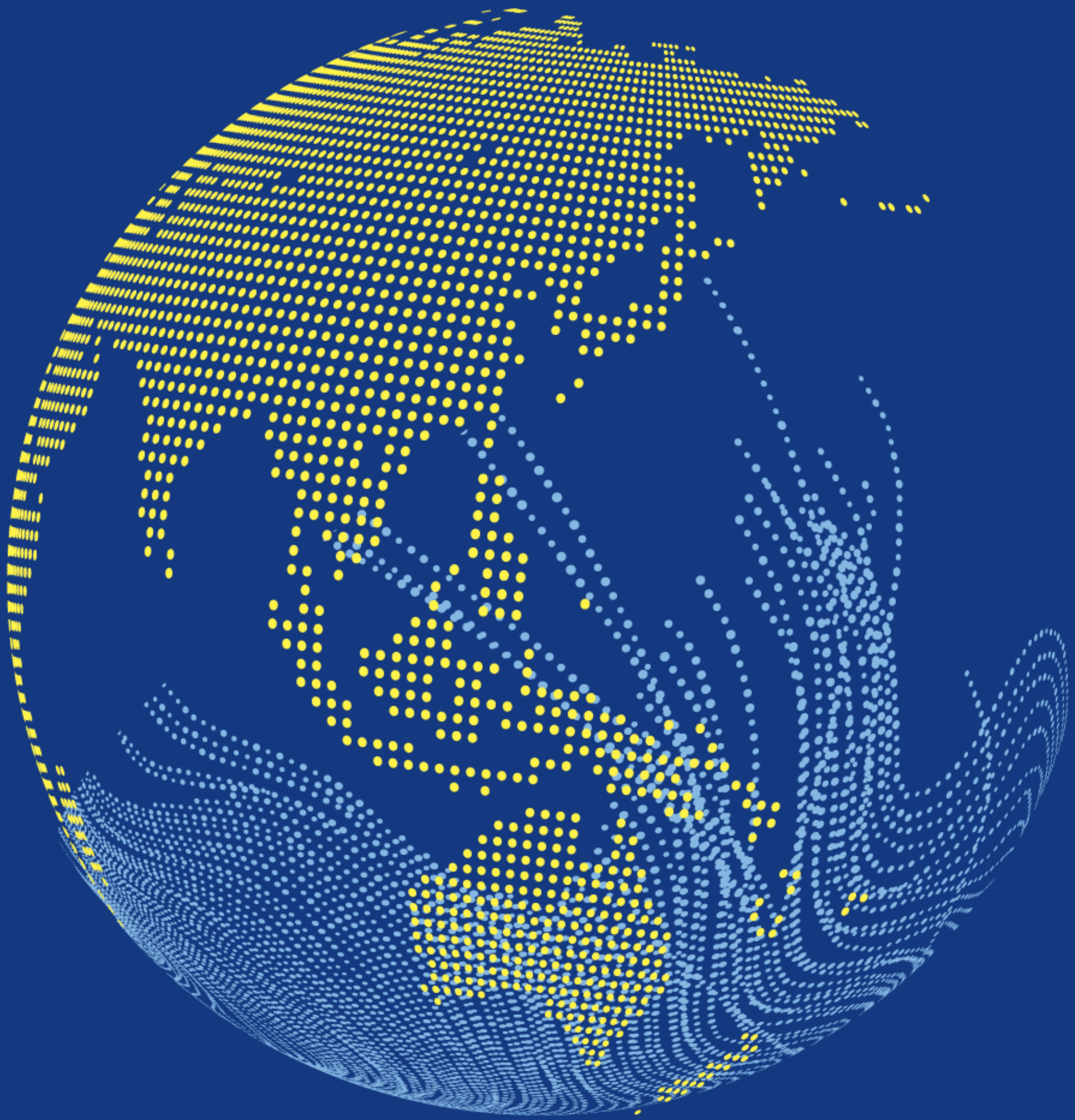
# Business Case for Natural Refrigerants



12/02/2019

TOKYO

# Global Policy & Market Trends

Marc Chasserot
**Group CEO, shecco**

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# Latest Policy Developments

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# EUROPE: HFC PRICES SKYROCKETING

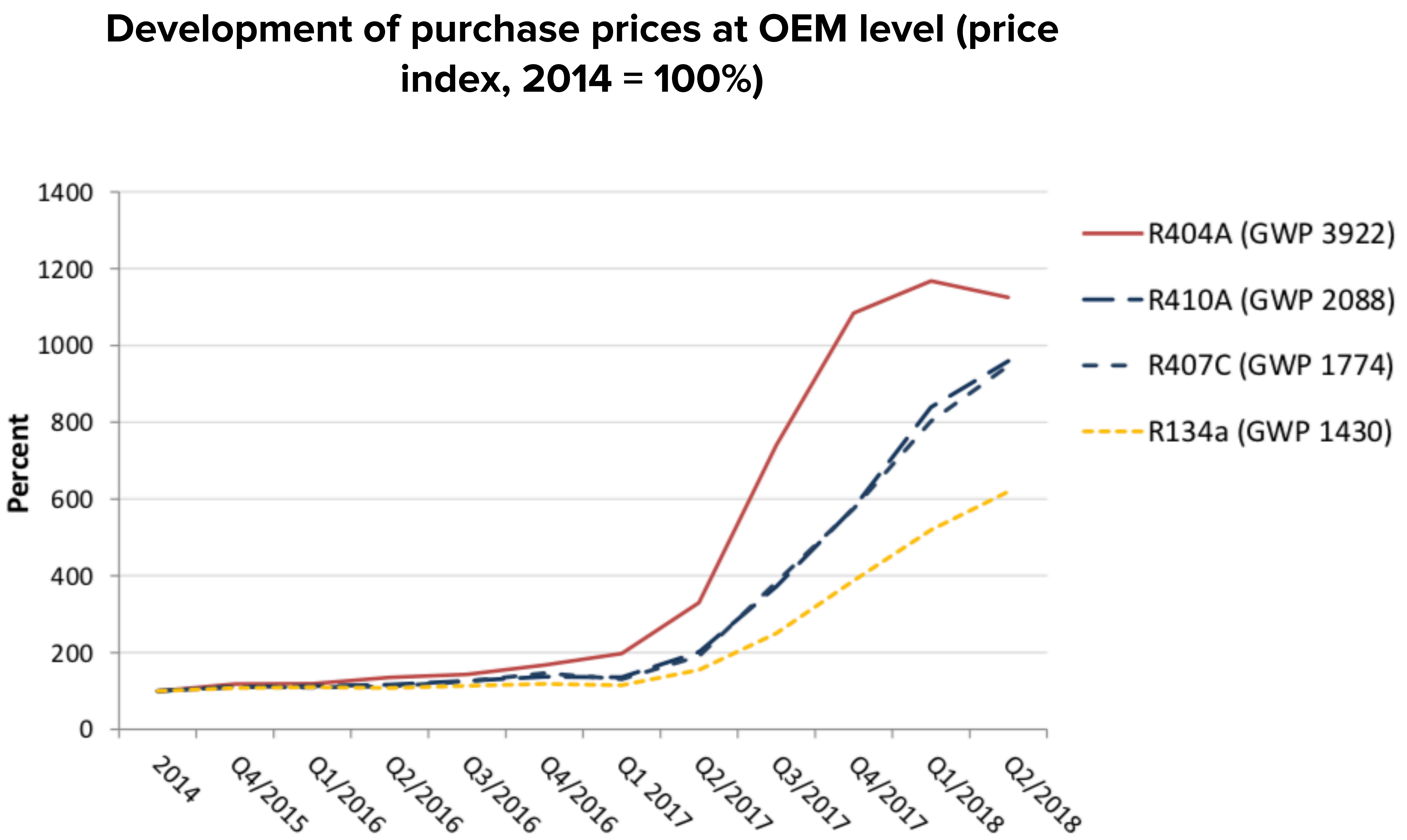
At the beginning of 2018, high GWP HFCs reached price peaks —> similar “wave-like”price trends expected in the future

Recent price increases much stronger for R134a/ R410A than R404A (based on $CO_2$eq)

Price increases have been completely passed on end users

Natural refrigerants still available at low prices

Source: Öko-Recherche



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# EUROPE: GETTING READY FOR HFC BANS

**2020 and 2022** will see the entry into force of some key HFC bans

Transition to natural refrigerants ($CO_2$ and hydrocarbons) in refrigeration is underway on a wide scale across Europe

Standards and certain national codes pose a barrier to introduction of HCs in higher charges

—> standard reviews will unlock the potential of HCs and ensure the compliance with f-gas legislation in the long-run

| HVAC&R sector | GWP limit | Deadline |
|---|---|---|
| Commercial refrigeration (hermetically sealed) | 2500 | 1 January 2020 |
| | 150 | 1 January 2022 |
| Stationary refrigeration* | 2500 | 1 January 2020 |
| Centralised commercial refrigeration** | 150 | 1 January 2022 |
| Movable room AC | 150 | 1 January 2020 |

* except for equipment designed for temperatures < -50 °C

** with capacity > 40kW, except in the primary refrigerant circuit of cascade systems where HFCs with GWP < 1 500 may be used

# **EUROPE: FRANCE TO INTRODUCE HFC TAX**

HFC tax **adopted in French Finance bill 2019, will enter into force as of January 2021**

Tax rates from €15/t$CO_2$eq in 2021 to €30/$CO_2$eq by 2025

Incentives for natural refrigerants:

- **40% corporate tax discount** provided for companies investing from January 1,  2019 until December 31, 2022, in new equipment using low-GWP refrigerants

**Denmark, Norway and Spain** already have HFC tax & refund schemes in place:

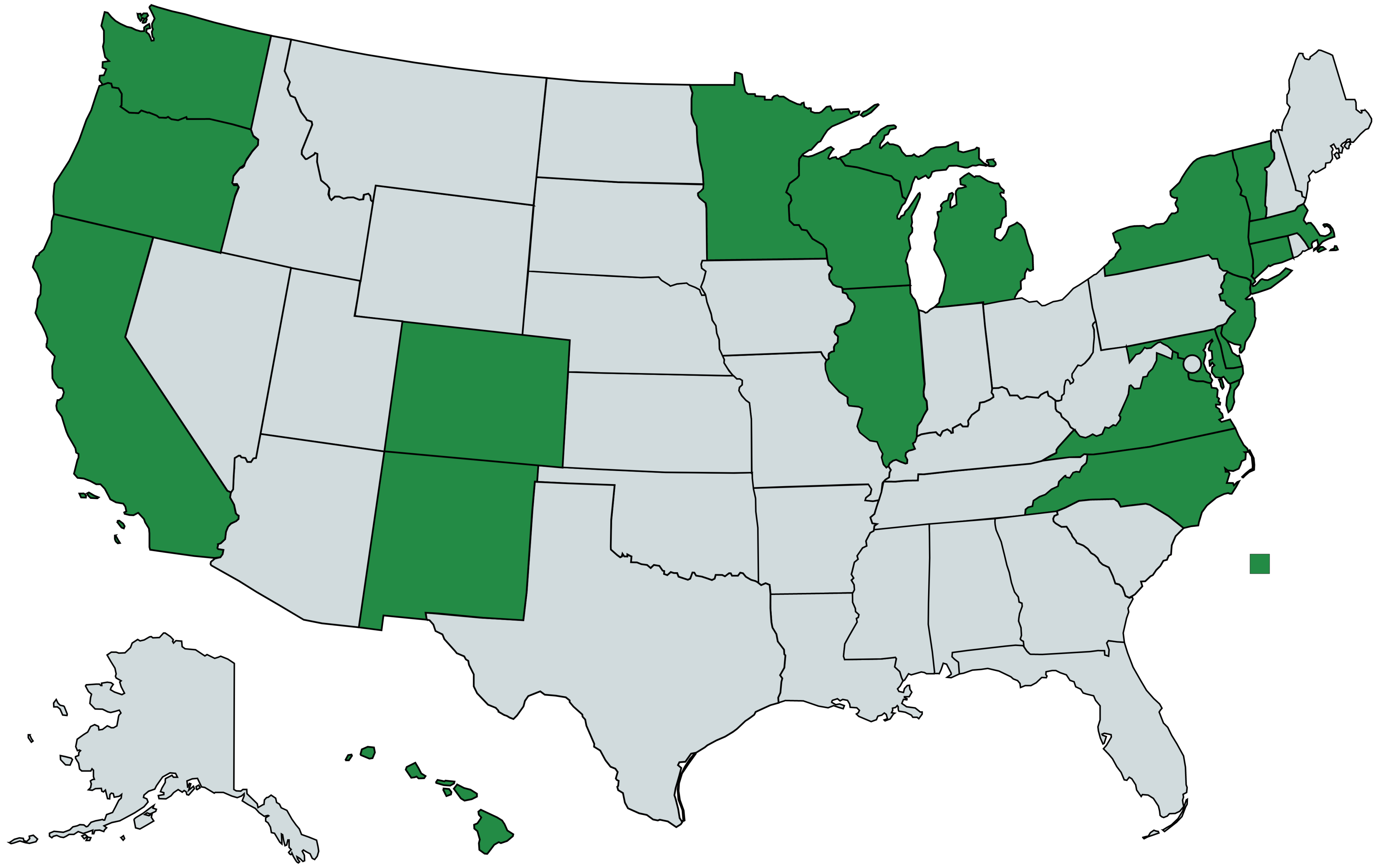
- tax rates range between €15/t$CO_2$eq (Spain) to €52/t$CO_2$eq (Norway)

# USA: STATES TAKING THE LEAD

**Federal level:** 32 top executives of HVAC&R companies urge President Trump to submit the Kigali Amendment to the Montreal Protocol to the U.S. Senate for ratification (May 15, 2018);

**US Climate Alliance - a coalition of 21 governors (20 US states + Puerto Rico) - announces commitment to phase-down HFCs**

- Already 4 of the states in the Alliance - California, New York, Maryland and Connecticut - have announced concrete plans to reduce HFC emissions



With 21 States, U.S. Climate Alliance represents **49% of U.S. population**, over 1/2 of national GDP and 35% of U.S. greenhouse gas emissions

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# USA: CALIFORNIA TAKING THE LEAD

HFC bans:

- January, 1 2019: **HFC bans in supermarkets** begin in California - Rule derived from EPA's SNAP Program Rule 20 & 21. Rule 20 was vacated in 2018 by a U.S. Court of Appeal ruling.

- Additional HFC bans (with GWP limits) to be finalised this year

Incentives for natural refrigerants:

- In 2018, **California passed Cooling Act:** State-wide law to authorise financial incentives for low-GWP refrigeration systems;

- Mid-2019: Legislature decides on Greenhouse Gas Reduction Fund (GGRF) funding, incl. the HFC incentive programme. Those grants would start in 2020.

**Japan is around the same size as California.** Meanwhile, the population in Japan is more than twice as high.

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# USA: GREEN NEW DEAL

Proposed economic investment programme (federal level) to address both climate change and economic inequality within 10 years of passing legislation

**Goals relevant for wider uptake of natural refrigerants:**

- Upgrade every residential and industrial building to "eliminate pollution and greenhouse gas emissions as much as technologically feasible" (incl. achieving maximum energy efficiency for all existing and new buildings);
- Fund "massive" investment, and make the U.S. a leading exporter of clean-tech products and services;
- Provide resources, training and high-quality education to all people of the United States to achieve the Green New Deal goals;
- Public investments in R&D "of new clean and renewable energy technologies and industries";
- Grow domestic manufacturing in the U.S. "providing all people of the United States with clean air".


Congresswoman Alexandria Ocasio-Cortez of New York and Senator Edward Markey of Massachusetts who introduced the resolution on Feb 7, 2019
(Credit: SAUL LOEB/AFP/Getty Images)

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# JAPAN: Main drivers & obstacles

**Subsidy program for natural refrigerants**:

- Major growth factor for $CO_2$ stores and $NH_3/CO_2$ industrial refrigeration

**Deregulation of $CO_2$ under High Pressure Gas Safety Act**

- Lifted a major legislative barrier for $CO_2$ in larger applications and led to growth in $CO_2$ in supermarkets & cold stores

**F-Gas Law - Designated products**

- Target of GWP 1500 by 2025 for condensing & refrigeration units > 1.5kW - low target considering availability of HFC-free technologies in this sector & level of ambition in other regions (e.g. Europe, California)

**HC risk assessment**

- No significant conclusions resulting from highly anticipated JRAIA HC risk assessment in December 2018 shecco Base

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# Market Trends

Commercial Refrigeration

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# $CO_2$ TRANSCRITICAL STORES FROM 140 TO > 20.000 IN 10 YEARS

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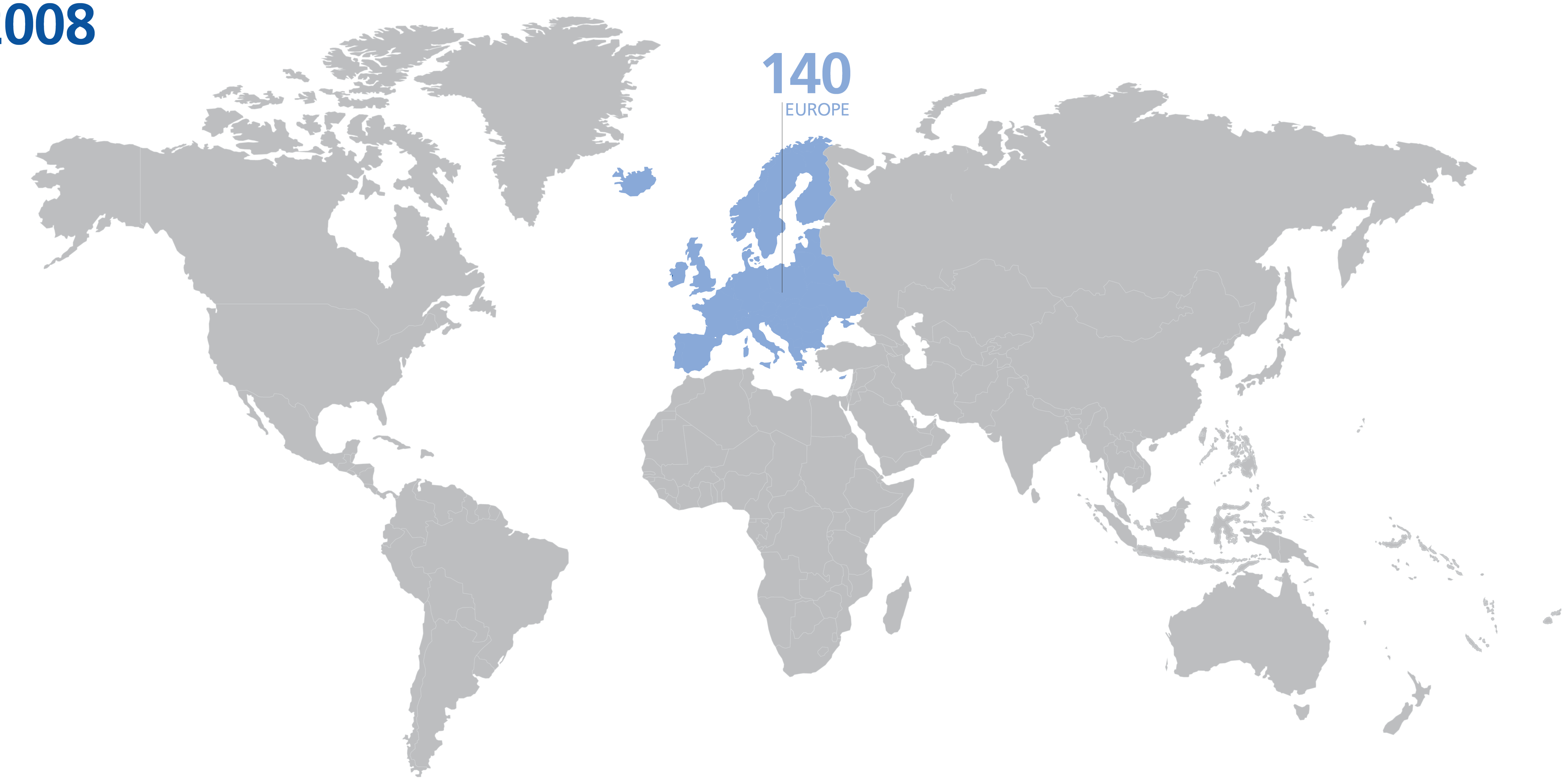


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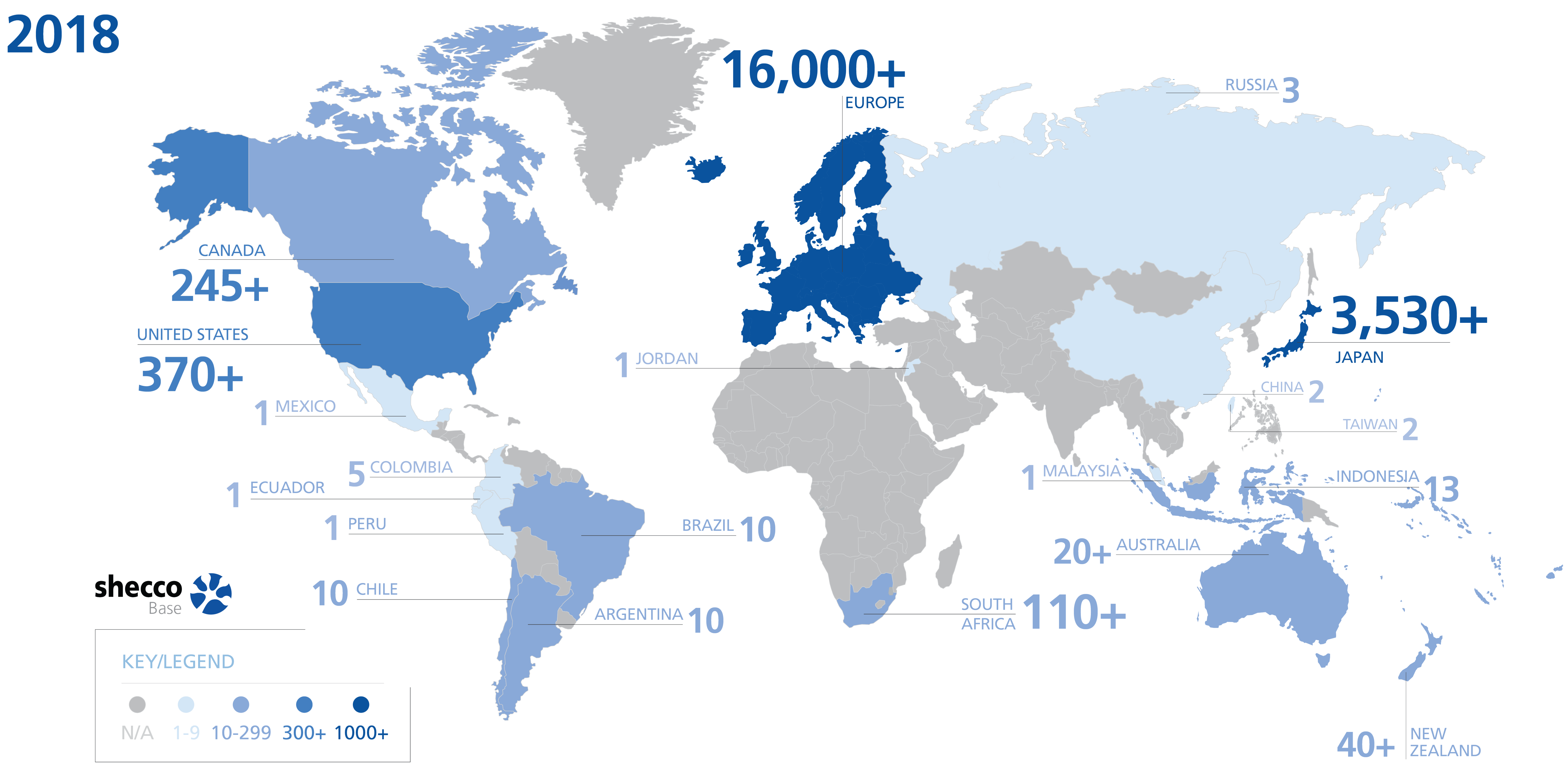
# $CO_2$ TRANSCRITICAL STORES FROM 140 TO > 20.000 IN 10 YEARS

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# HC SOLUTIONS FOR SMALL STORES

Global market estimate (August 2018)

= **2.5 million hydrocarbon-based supermarket showcases** (excl. light commercial refrigeration such as bottle coolers, vending machines)

In early 2017 there were about 1.5 million units

**Increase of HC charge limits** in industry standards is key for the future uptake of hydrocarbons

## HYDROCARBON WATERLOOP

There are an estimated **1,900+ stores globally, 1,700+ in Europe**

- lower energy consumption - around 25% reduction
- faster installation & low maintenance costs
- competitive advantage in warm climates
- flexible store layout changes
- lower total cost of ownership

Main challenge to overcome: R290 charge limits shecco Base

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# Market Trends

## Industrial Refrigeration

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# LOW-CHARGE AMMONIA INSTALLATIONS

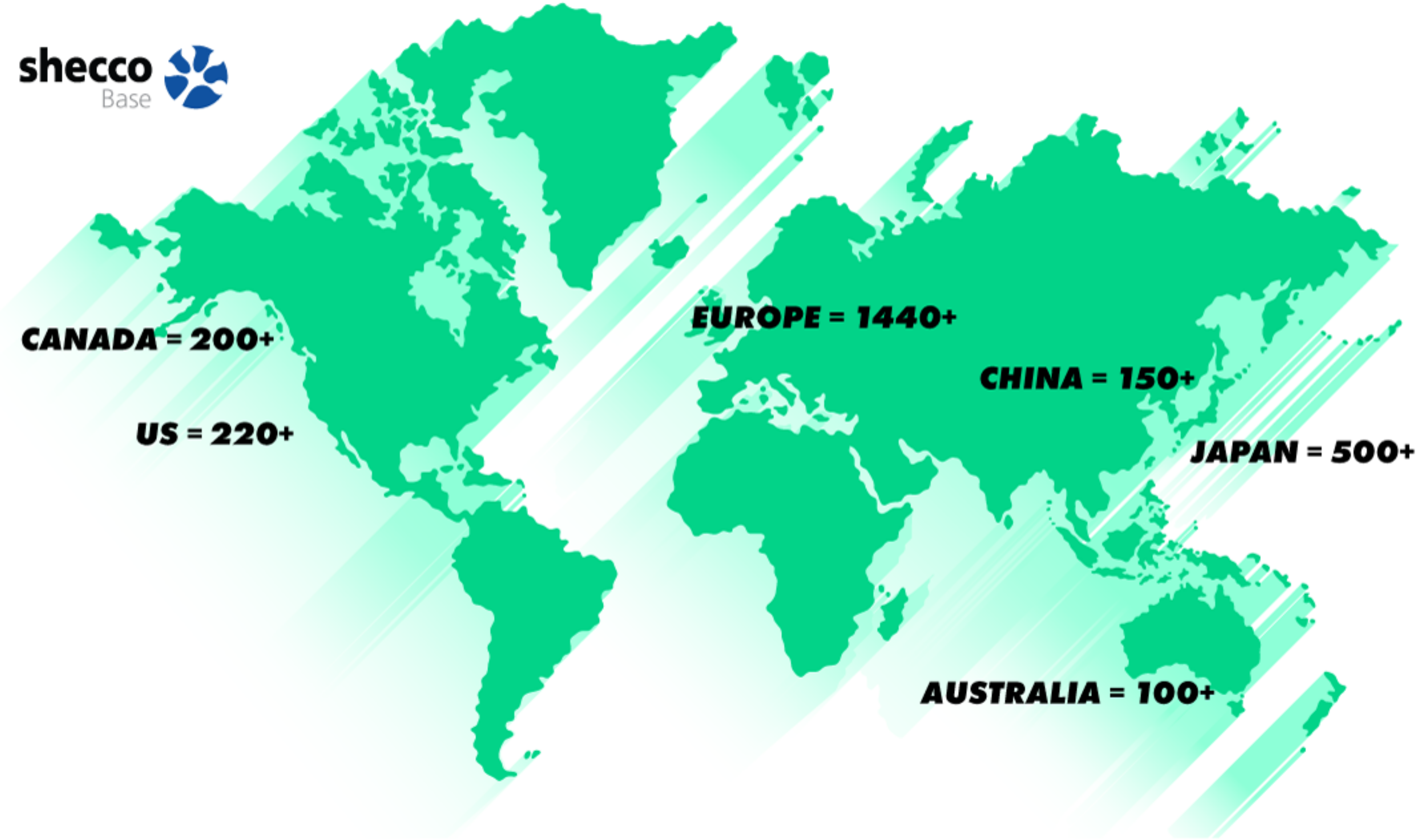
Industrial refrigeration traditionally dominated by ammonia and HFCs is experiencing transition to 'next-generation technologies'

Increased safety —> lower risk

Higher efficiency

Easier servicing

ROI for the end-user

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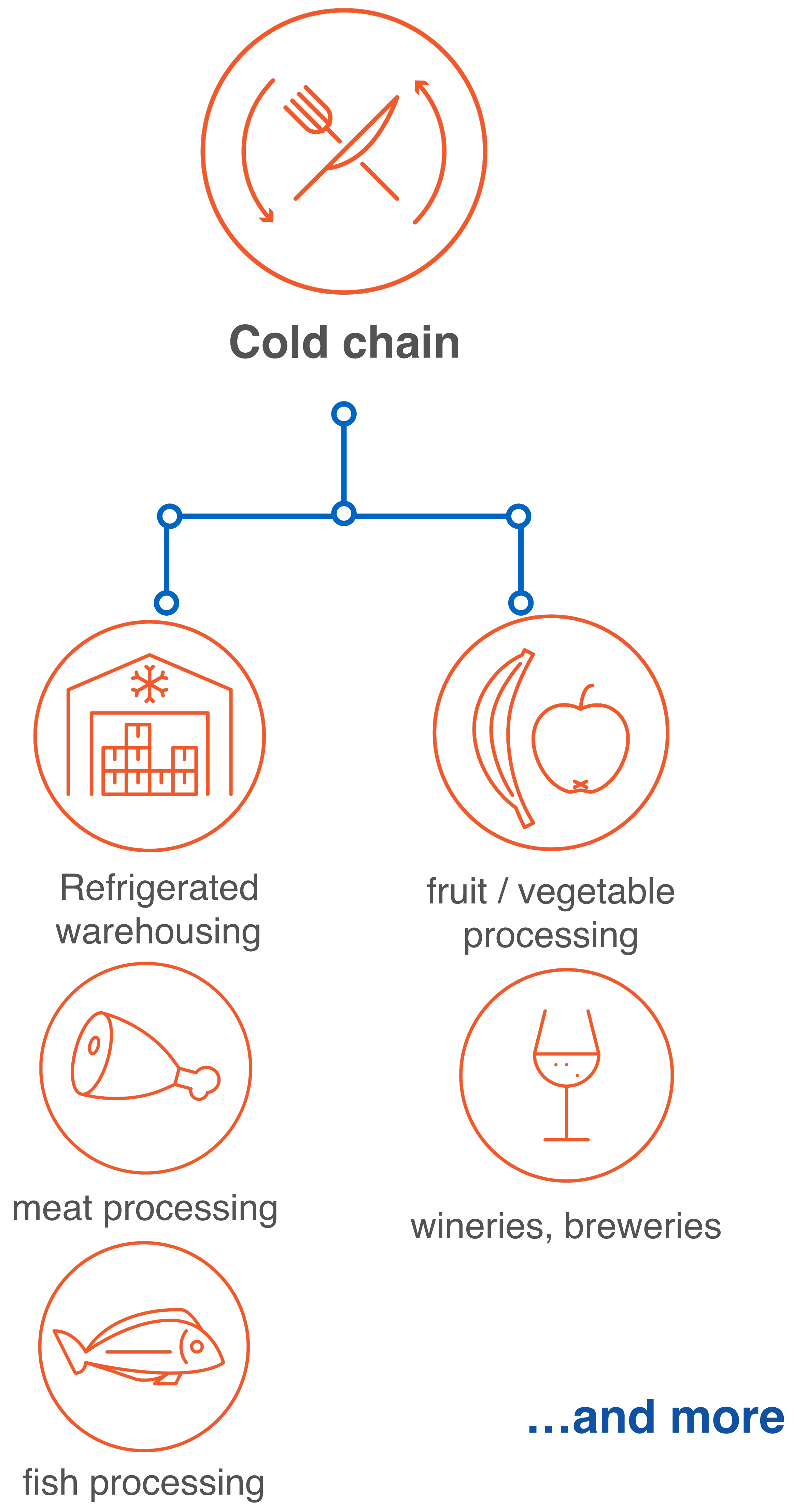
# $CO_2$ IN INDUSTRIAL REFRIGERATION

More than **25 companies** known to be providing $CO_2$ transcritical systems for industrial applications globally;

All major compressor manufacturers claiming to offer large-capacity compressors, with some aiming to push limits even further;

**Transcritical $CO_2$ in industrial applications expected to grow five-fold by 2020**



# Market Trends

HVAC

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# GLOBAL TRENDS FOR AC

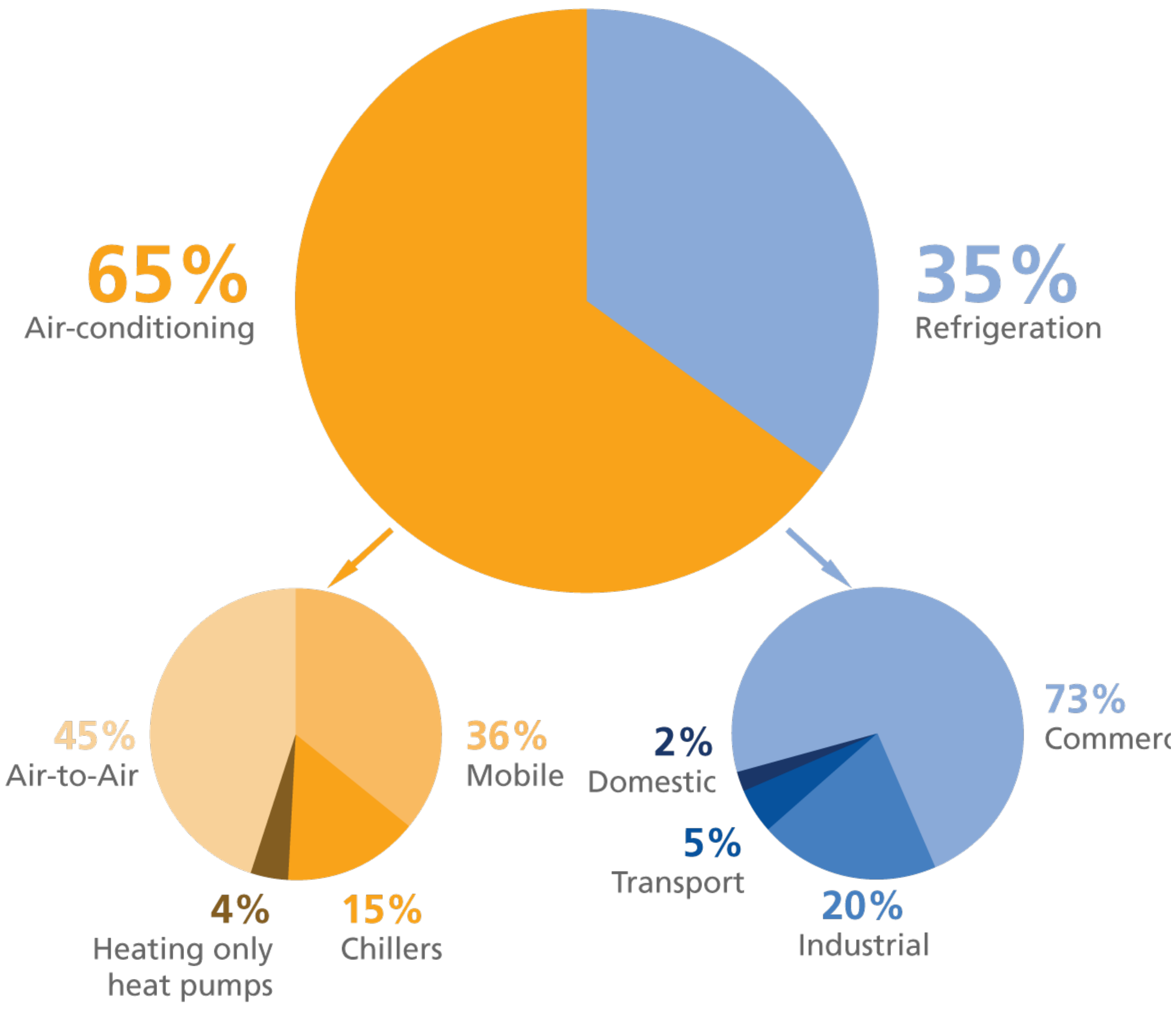
By the end of 2016, an estimated **1.6 billion ACs** were in use globally - 2/3s are residential and 1/3 commercial

The global stock of ACs is expected to **grow to 5.6 billion by 2050**

=

Energy efficient, HFC-free cooling should be introduced rapidly to avoid locking in damaging technologies

**AC is responsible for 65% of global HFC use**

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# GLOBAL COOLING PRIZE

**$3 million prize** for innovative, climate friendly technologies for **residential cooling**

The winning technology will receive **$1 million to support incubation, and early-stage commercialisation**

# KEY DEVELOPMENTS FOR HFC-FREE COOLING

**HC split residential AC**

- China: production capacity to make 6 mil R290 residential ACs / year, currently < 10,000 installed
- India: > 600,000 R290 units installed
- Other countries converting production lines (Thailand, Bangladesh)

**Commercial $CO_2$ heat pumps**

- Growing interest in $CO_2$ heat pumps targeting commercial hot water supply, air-conditioning applications
- Globally estimated 15,000 commercial $CO_2$ (majority in Japan & China)

**HC chillers**

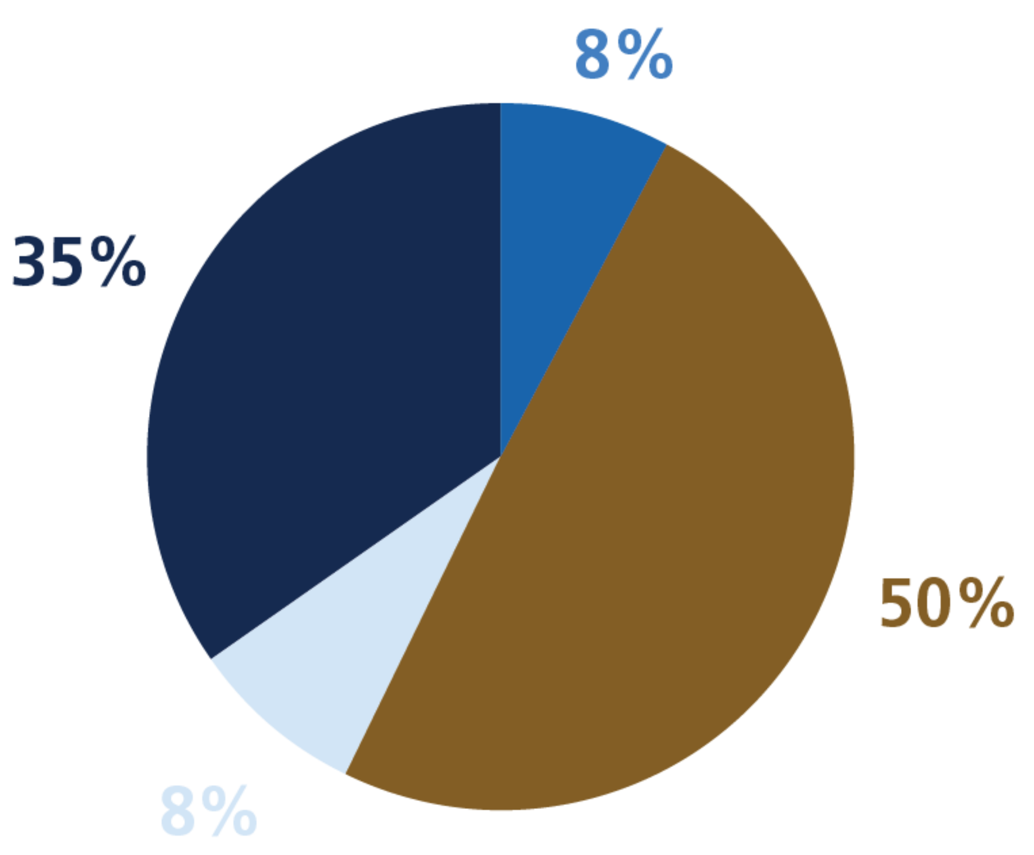
- Growing number of manufacturers offering HC-based water chillers targeting commercial air-conditioning and process cooling applications

# HVAC&R SECTOR

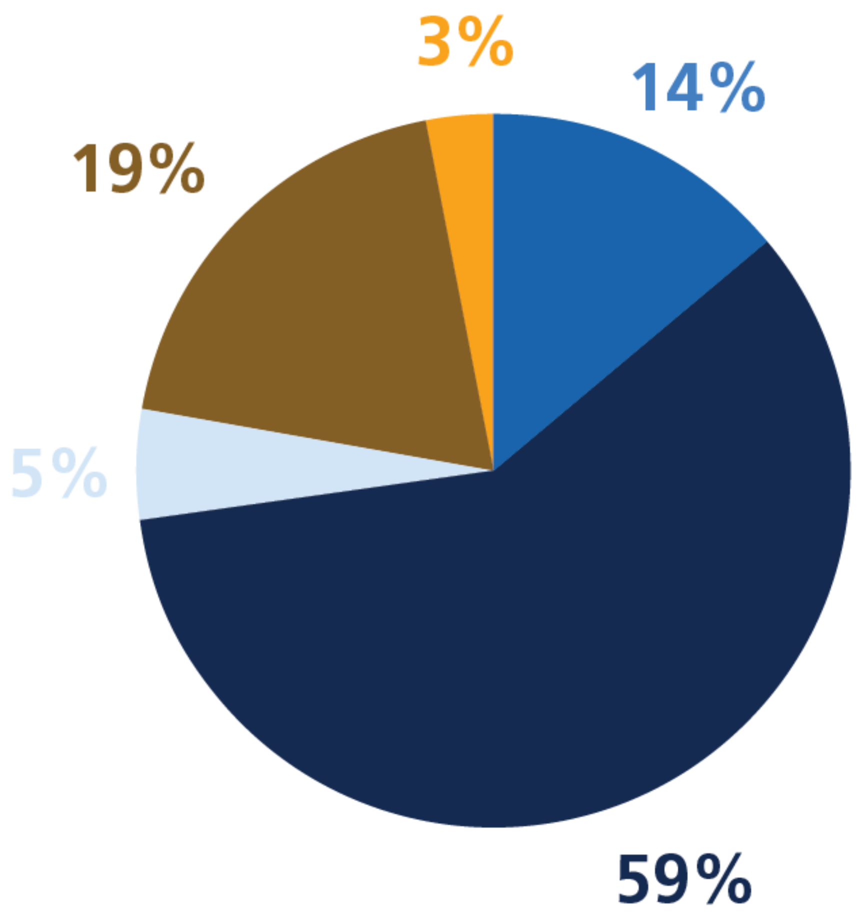
Which sector still needs more pressure or support from the policy side to quickly move towards natural refrigerants in your region?

- Commercial AC & Heat Pumps
- Commercial and light commercial refrigeration
- Mobile Air Conditioning
- Residential AC & Heat Pumps
- Transport Refrigeration

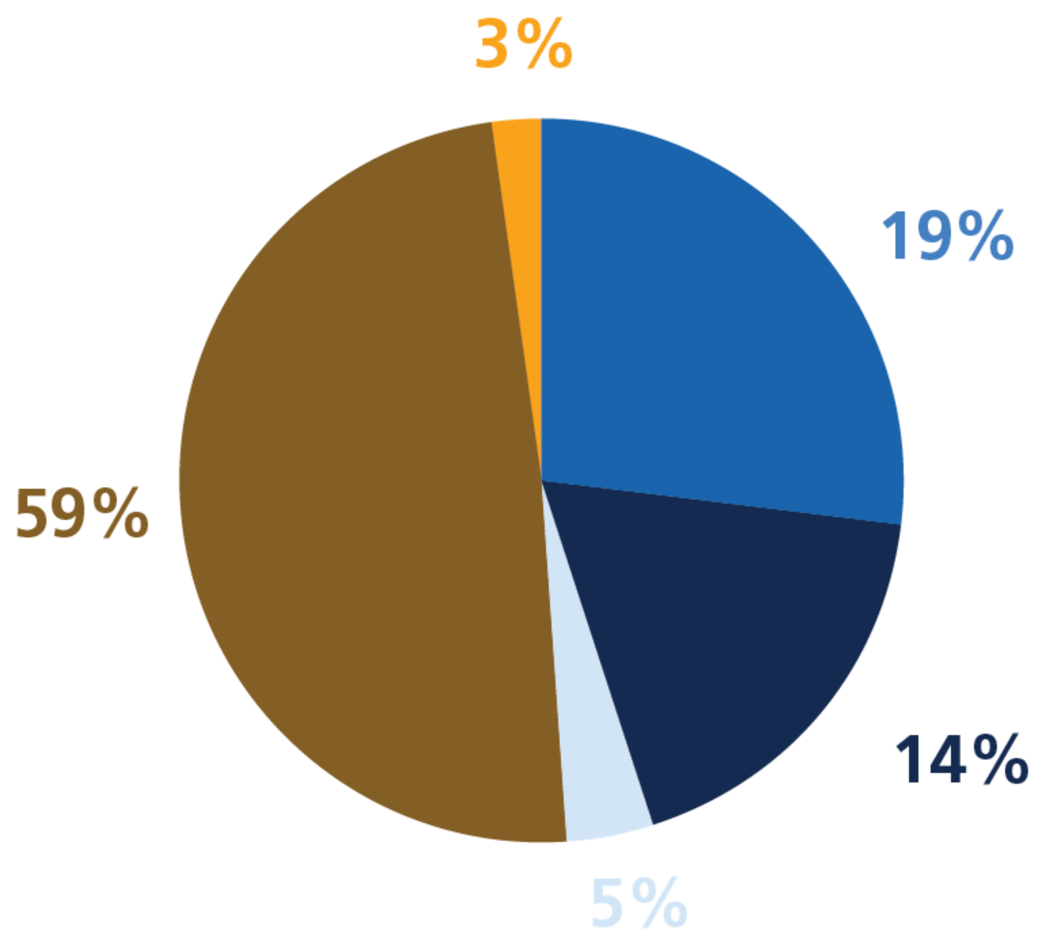
**ATMO Australia**



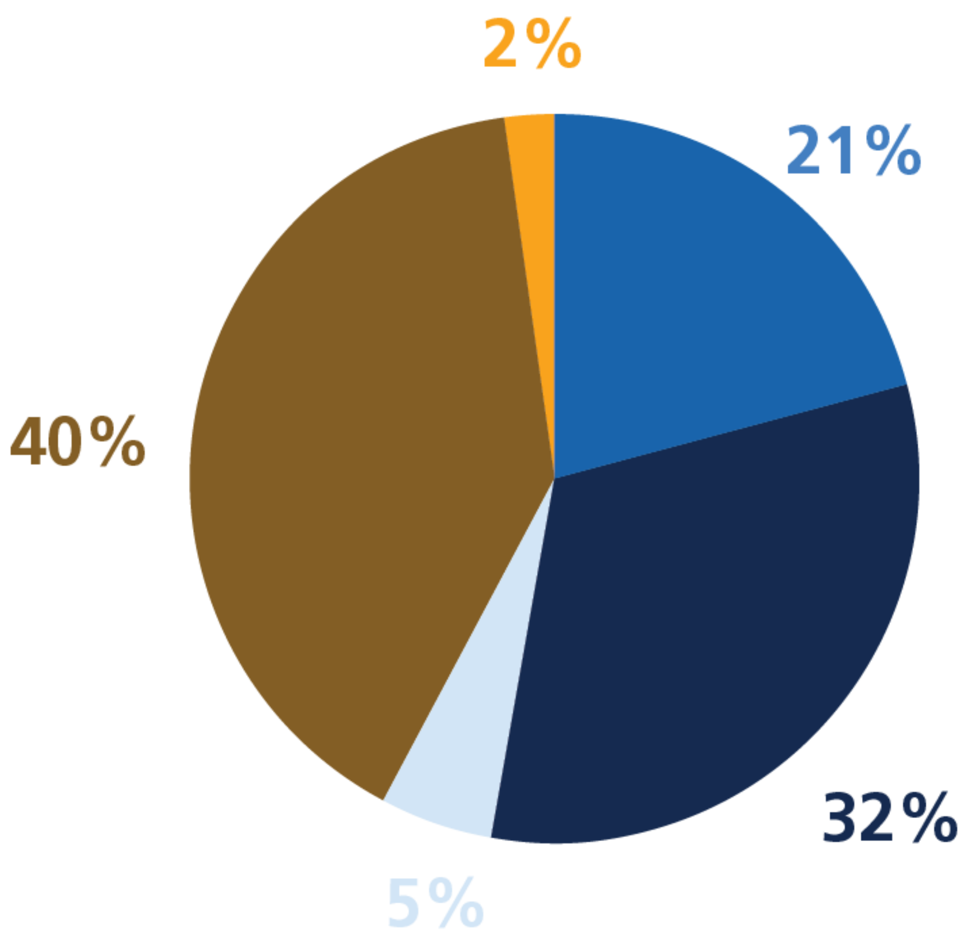

**ATMO China**




**ATMO Europe**




**Grand Total**



# SECTOR WITH HIGHEST GROWTH

Which market sector will see the most uptake of natural refrigerants in the next 5 years in your region?

Commercial AC & Heat Pumps

Mobile Air Conditioning

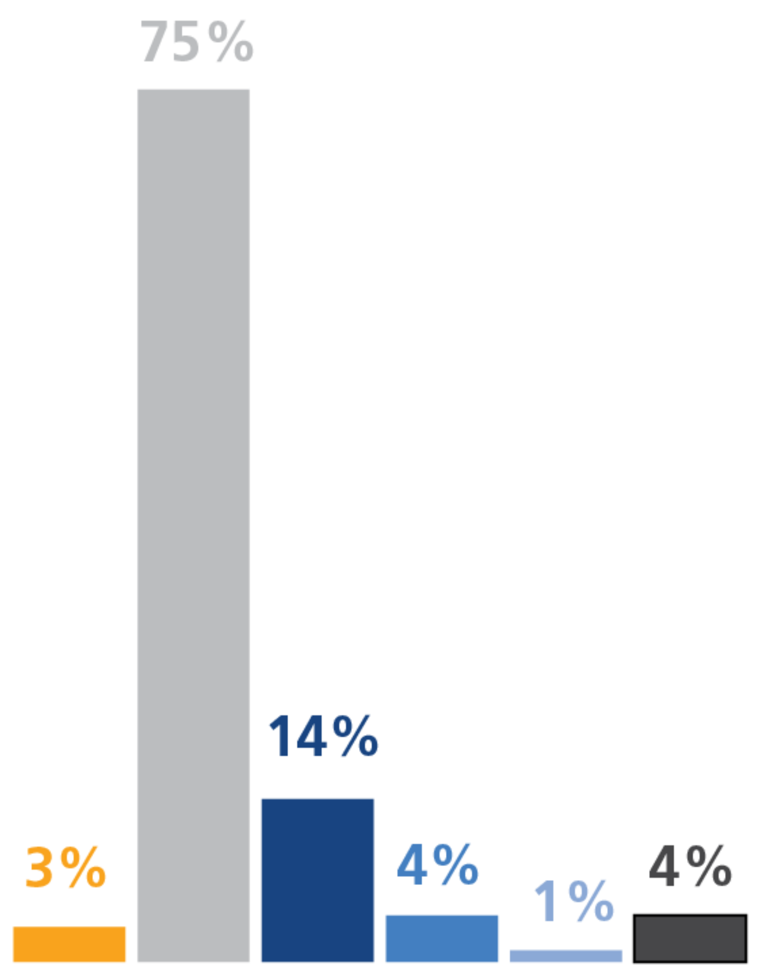
Commercial and Light-Commercial Refrigeration

Residential AC & Heat Pumps

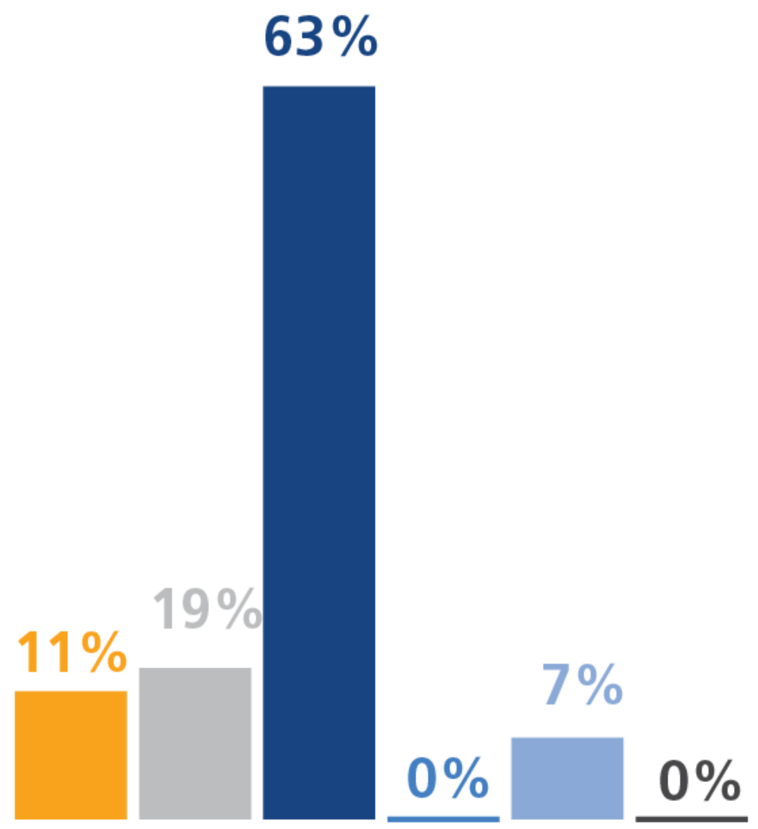
Industrial refrigeration

Transport Refrigeration

## ATMO America




## ATMO Asia

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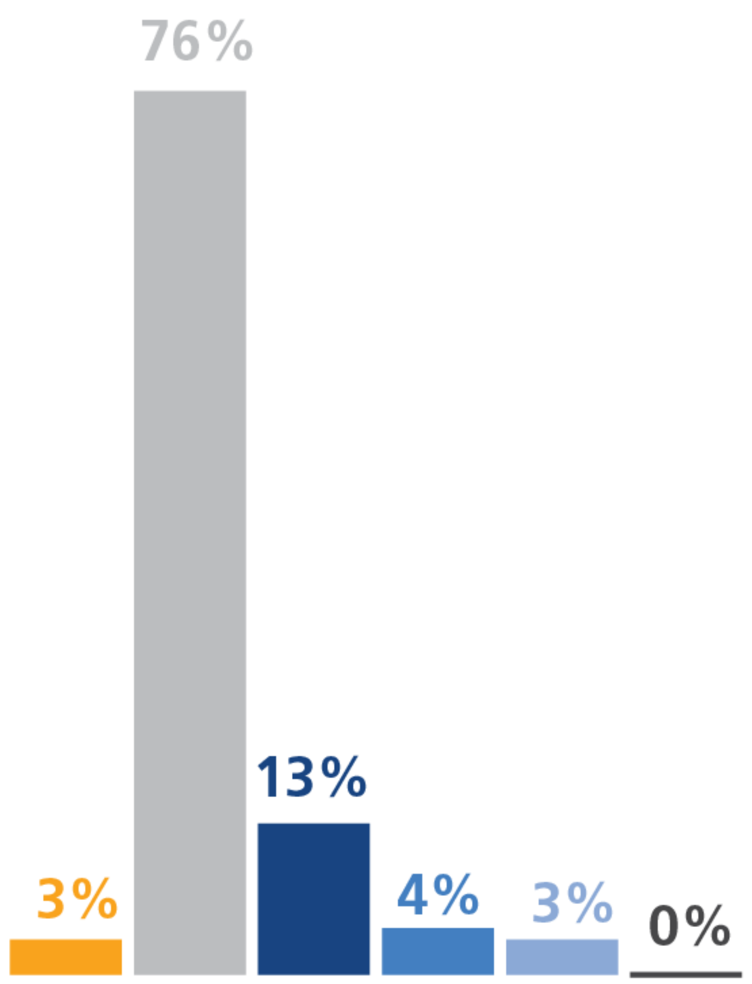
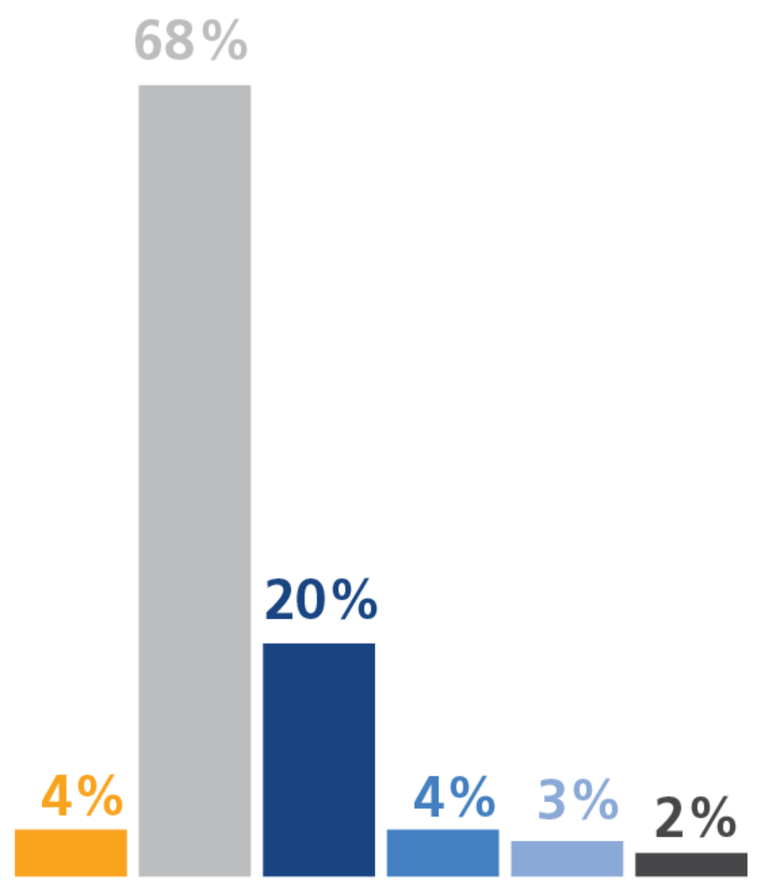



## Grand Total



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# Thank you for listening.