Natural refrigerants - latest policy trends

Tokyo, 13 July 2016

Marc Chasserot, CEO, shecco

PROGRESS TOWARDS GLOBAL HFC PHASE DOWN

Progress in Geneva (April 2016)

- countries started **addressing concrete challenges**

- tentative agreement on **4-year exemption from HFC phase-down in certain types of AC for countries with high ambient temperatures**

- TEAP presented a report with **80 alternatives, most of which are newly developed HFC blends**

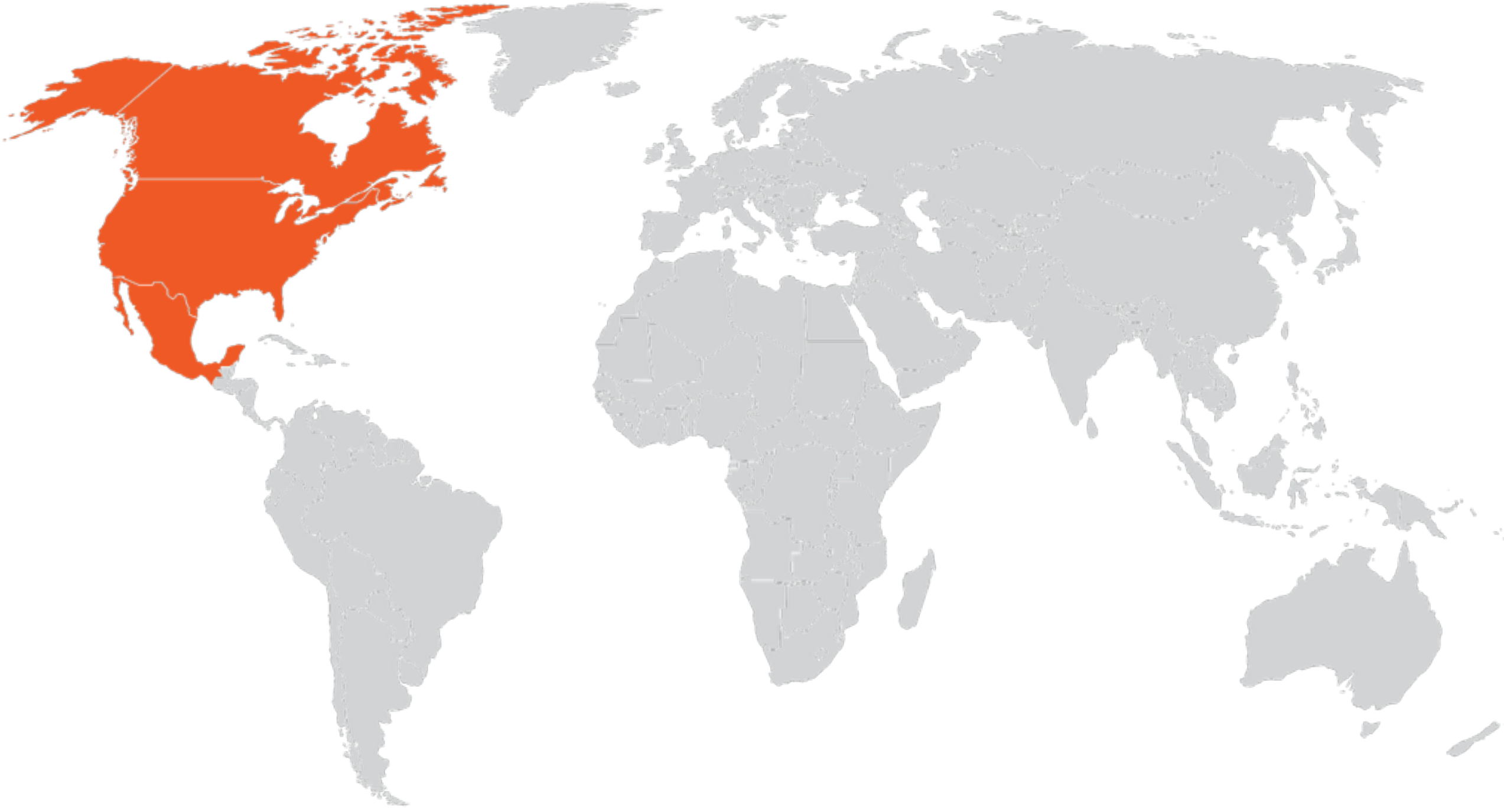
2016: 4 meetings, including 2 extraordinary

- **April 2016**, Geneva, Switzerland

- **July 2016**, Vienna, Austria (2 meetings)

- **Oct 2016**, Kigali, Rwanda

NORTH AMERICA: GROWING INTEREST IN NATURALS



USA: EPA TAKES FURTHER ACTION ON HFCS

New SNAP proposal published in March 2016

- **Hydrocarbons acceptable**

  R290 in new **commercial ice machines, water coolers and very low temperature refrigeration** equipment

- **Hydrocarbons unacceptable**

  A3 refrigerants in **retrofit** residential and light commercial **AC & heat pumps**

  propylene and R443A in new residential and light commercial AC & heat pumps, cold storage warehouses, centrifugal and positive displacement chillers

- **High GWP HFCs (incl. R404A, R410A, R134a…) unacceptable**

  new **retail food refrigeration** (refrigerated food processing & dispensing equipment) + **household refrigeration** - **2021**

  new **cold storage warehouses** - **2023**

  new **centrifugal and positive displacement chillers** - **2024**

USA: EPA TAKES FURTHER ACTION ON HFCS

Section 608 of Clean Air Act

regulates obligations for maintenance & leak repairs

currently applies only to HCFCs/ CFCs

2015 proposal:

aims to extend the provisions to HFCs

suggests lowering the "trigger" leak rate requiring repairs from 35% to 20%

expected to be finalised in 2016

Recent settlement case:

Trader Joes failed to comply with Section 608 of Clean Air Act

fine of **$500,000**

$2 mil to spend on efforts to reduce leak repairs and GHG emissions across all of their grocery stores

= retailer agreed to use non-ODS refrigerants in all of its new stores - **15 new ones will be low-GWP refrigerants**

USA: CALIFORNIA PROPOSES HFC RESTRICTIONS

High GWP refrigerant prohibitions in new stationary systems

GWP > 150 in non-residential refrigeration - as of **2020**

GWP > 150 in residential refrigeration - as of **2021**

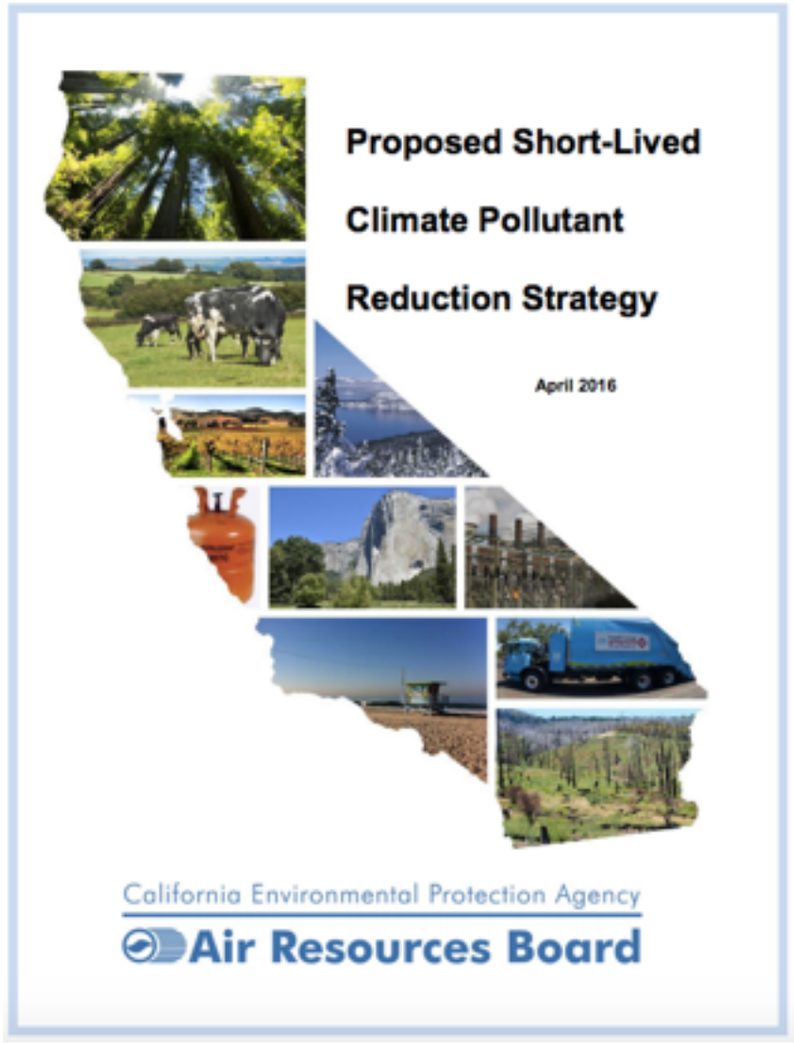
GWP > 750 in stationary AC - as of **2021**

Financial incentives: to motivate early adopters of low GWP refrigeration in commercial refrigeration

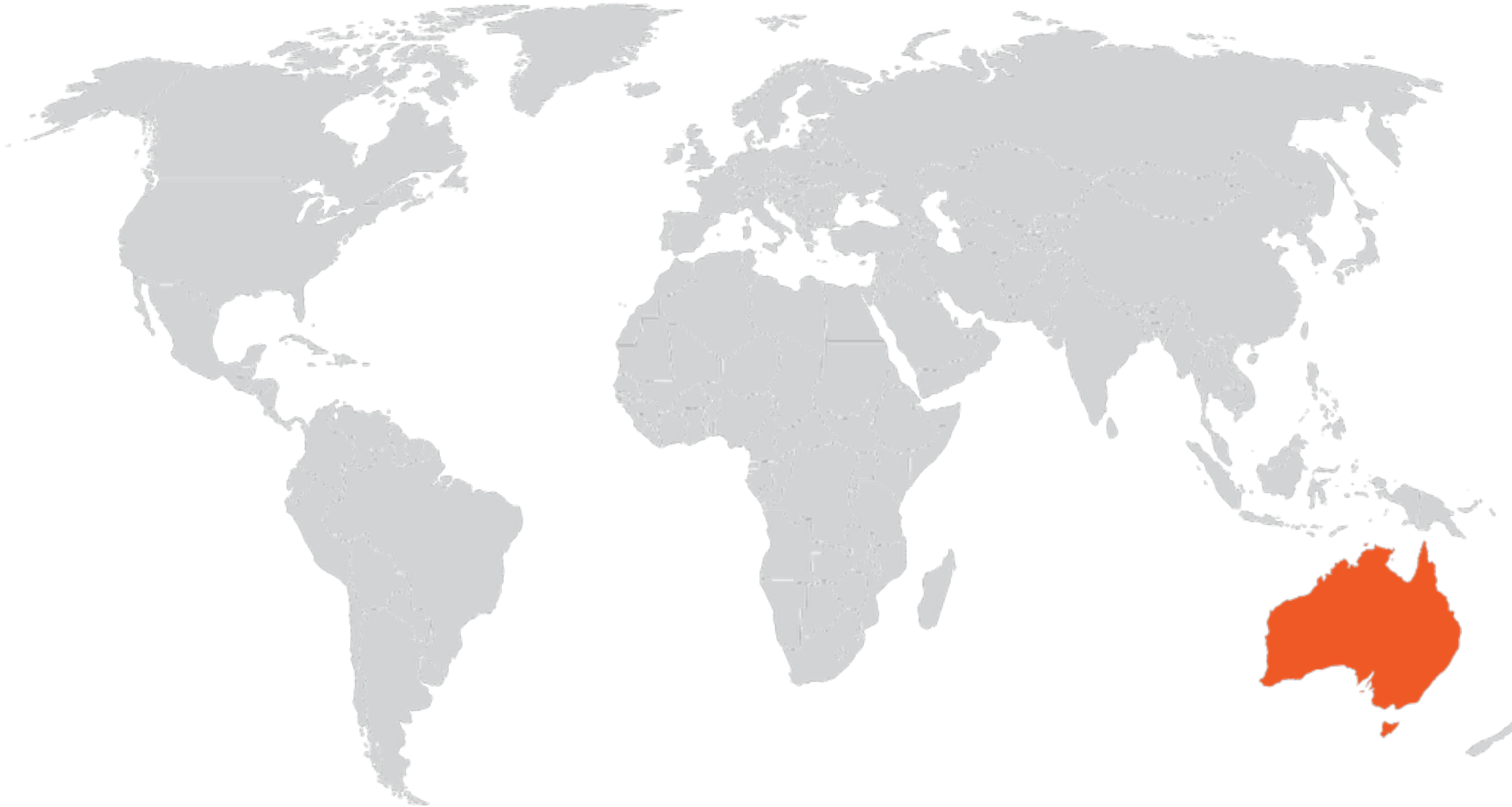
$20 million proposed under Governor's 2016-17 budget to reduce HFCs

Prohibition on sale of new refrigerants with high GWP (>2500) as of 2020: in line with EPA's rule to prohibit refrigerants like R404A under SNAP

Phase down in supply of HFCs: potential California-wide HFC phase-down in the absence of an international agreement in 2016



AUSTRALIA: HFC PHASE-DOWN



AUSTRALIA: HFC PHASE-DOWN

- In June 2016, Australia announced **phase-down of HFCs by 85% by 2036**

- Phase-down will apply **as of 2018**

- Amendments will enable provisions for **future bans on imports of equipment containing high GWP HFCs** (especially for domestic and automotive AC)

Australian Government
Department of the Environment

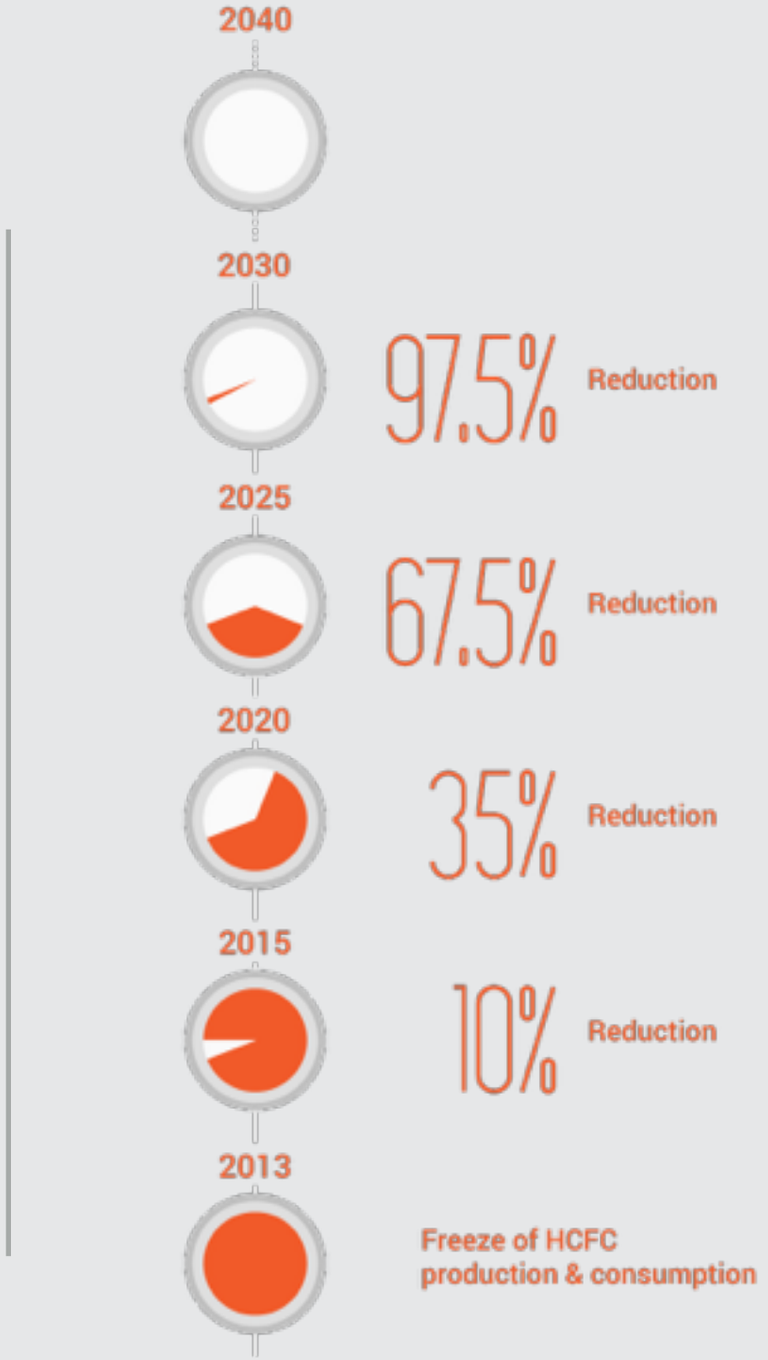
CHINA: CHANGING POLICY LANDSCAPE

CHINA: POLICY TRENDS

- phase-out of **production and consumption of HCFCs by 2030** = global impact

- revised **Environmental Protection Law in 2015**, after 25 years = increasing accountability of polluters and government for environmental issues

- increasing **government support for natural refrigerants** in several sectors, especially room AC, heat pumps, commercial & industrial refrigeration



CHINA: RECOMMENDED SUBSTITUES TO HCFCS

HC	residential air conditioning plug-in commercial refrigeration
CO_2	residential heat pump water heaters commercial heat pump water heaters industrial heat pump water heaters mobile air conditioning commercial and industrial refrigeration
NH_3	industrial refrigeration transport refrigeration condensing units

NEXT STEPS

final version expected soon (almost no change compared to draft)

Promotion / incentives / standards

2nd stage HCFC Phase Out Management Plan

standards review at national / international level

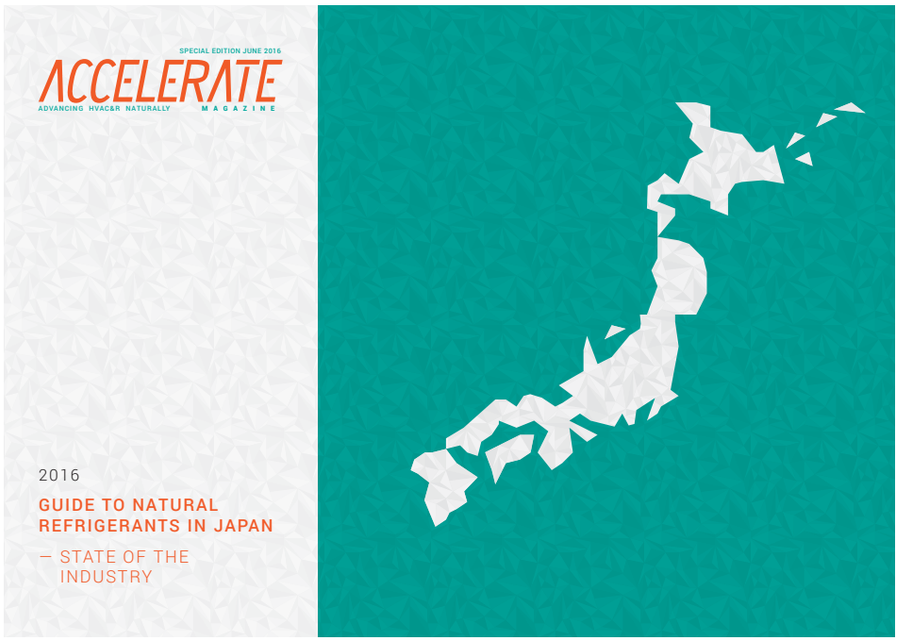
GUIDE JAPAN 2016 - State of the Industry

Tokyo, 13 July 2016

Marc Chasserot, CEO, shecco

GUIDE to natural refrigerants in Japan - State of the Industry 2016

- 1st ever comprehensive guide on natural refrigerants, market, technology and policy trends
- Technology & market maps
- 4 sectors in focus - commercial, light commercial, industrial refrigeration, heat pumps
- Voice of key industry players
- Industry survey
- Market outlook
- Case studies



DRIVERS FOR NR UPTAKE

- Lack of negative **environmental impact** is the most important driver

- **Efficiency & performance** and **compliance with legislation** are also very important factors

- **Financial incentives** rank higher than in other regions indicating the important role that the subsidies for NR technology are playing in the market

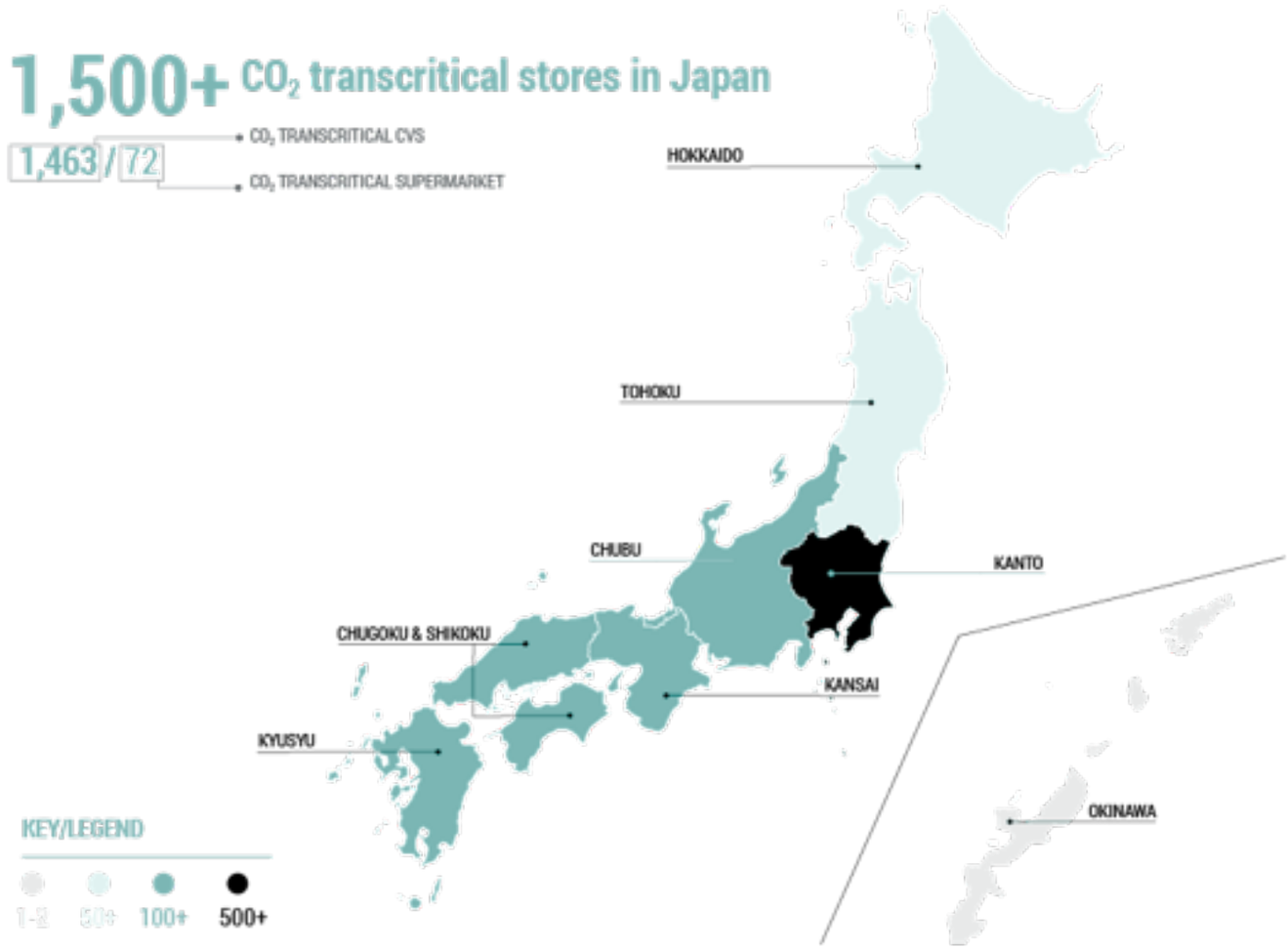
CO_2 REFRIGERATED FOOD STORES IN JAPAN

from 190 CO_2 stores to 1,500+ in just 2 years - a major success story putting Japan at the forefront of global CO_2 adoption!

out of that **1,463 are small CVS** which use less than 10 kW

NEXT: export of Japanese CO2 technology to SE Asia and other regions, incl. Australia and Europe

BUT: only **72 supermarkets have CO_2 TC** refrigeration - one reason: the High Pressure Gas Safety Act slows down their use in larger systems



source: shecco, GUIDE Japan - State of the Industry 2016

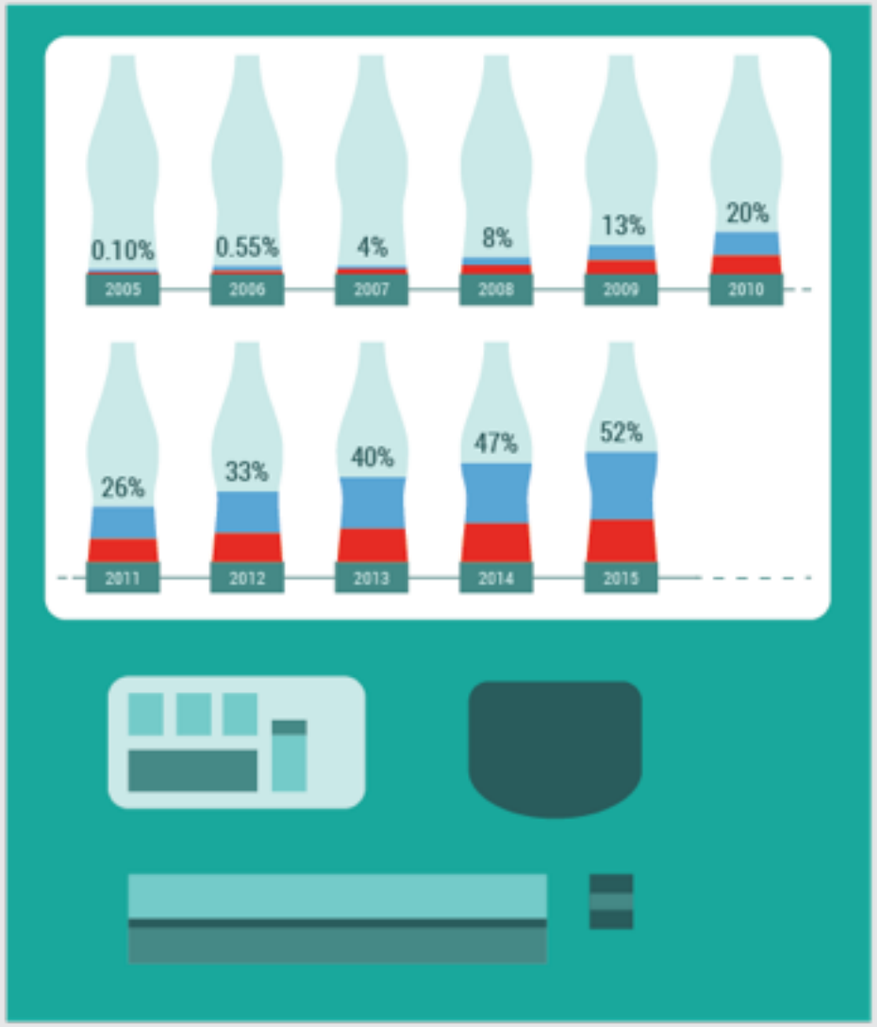
LIGHT-COMMERCIAL REFRIGERATION IN JAPAN

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

natural refrigerants make up over **50% of the market**

from 0.1% to 52% market share in just 10 years ! = a clear Japanese success story

BUT: Japan has not made similar progress in NR use for small plug-in units - a major trend in other world regions (especially for HC)



source: shecco, GUIDE Japan - State of the Industry 2016

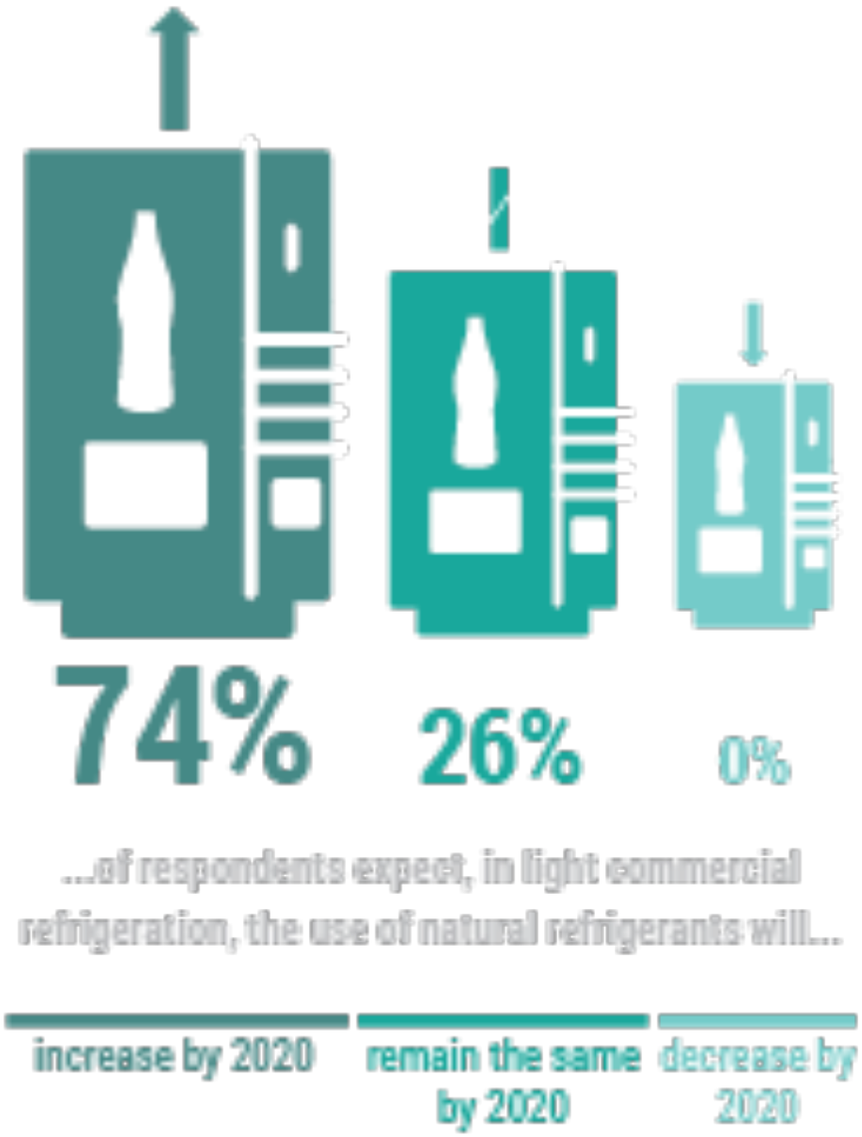
FUTURE USE OF NR IN LIGHT-COMMERCIAL REFRIGERATION

- nearly 3/4 of survey respondents expect that NR in commercial refrigeration **will continue to grow** at least until 2020

- no survey respondents expect that the uptake of NR will decrease

- the use of **hydrocarbons and CO_2** is expected to grow in bottle coolers, plug-in cabinets, vending machines

BUT: stronger commitment for NR by local and global consumer brands is needed to avoid use of new unsaturated HFCs



INDUSTRIAL REFRIGERATION IN JAPAN

the market is changing, from a strong reliance on R22 to a renewed uptake of (lower charge) NH_3 systems

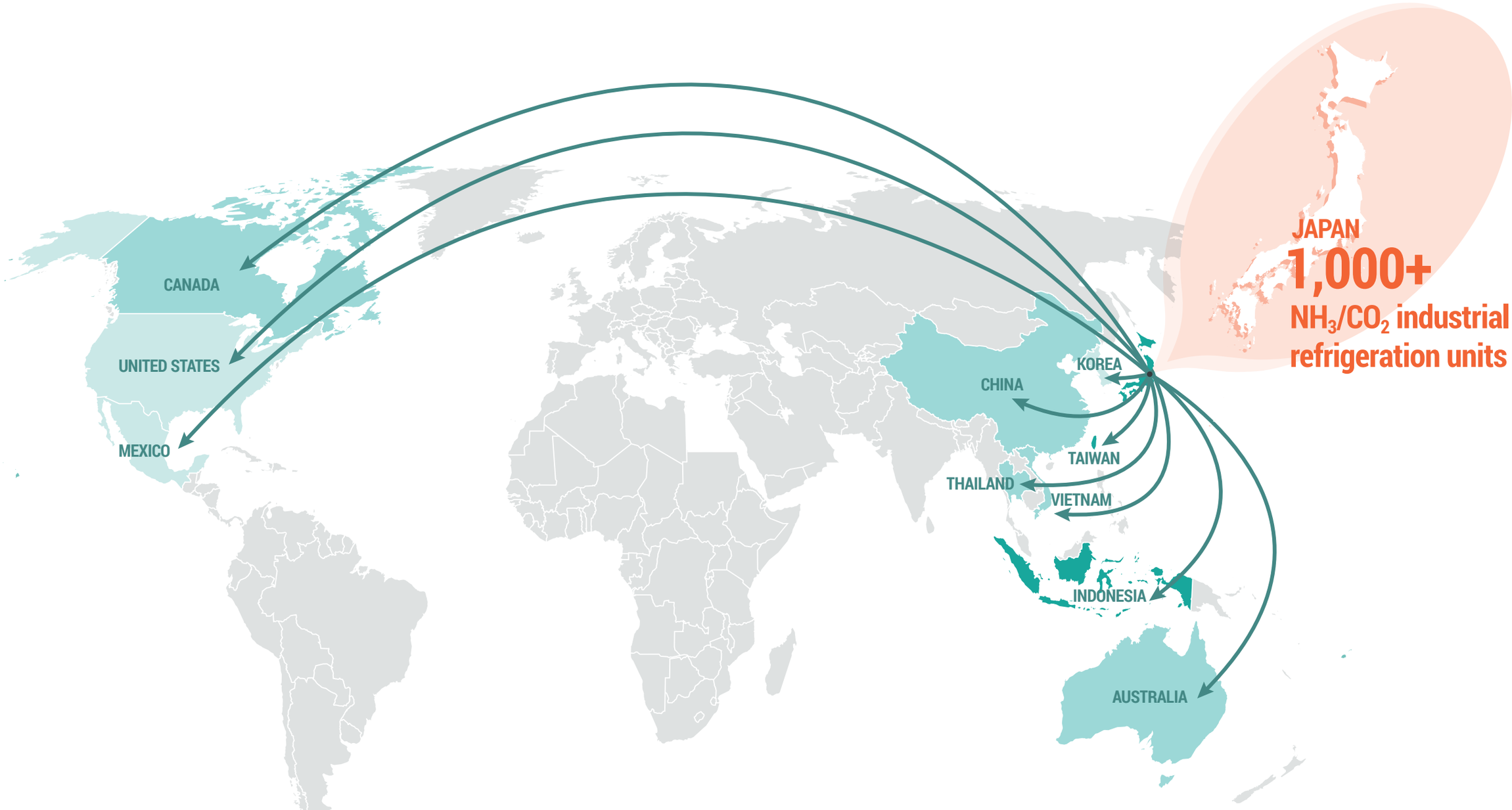
300+ installations use secondary NH_3-CO_2 systems

NEXT: export of the technology to other regions

BUT: the use of CO_2 transcritical systems still faces restrictions through the High Pressure Gas Safety Act

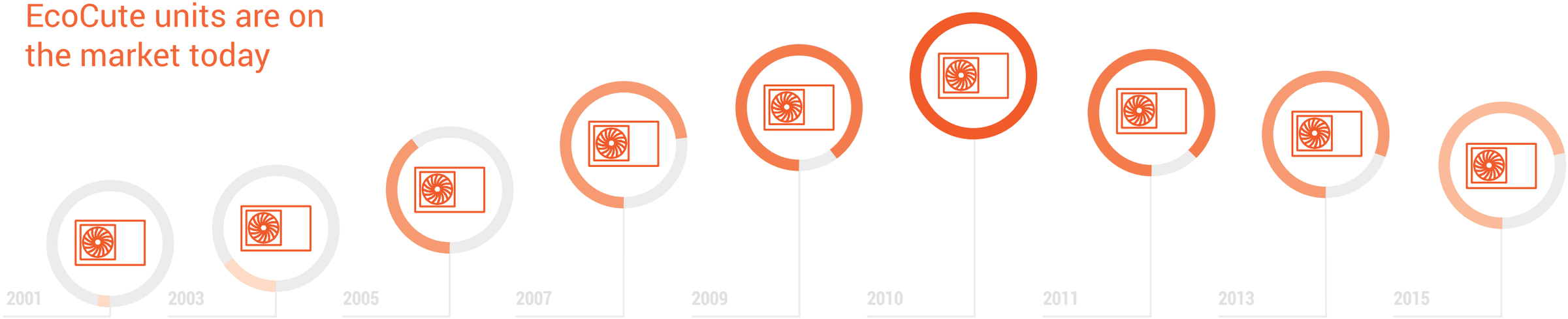
source: shecco, GUIDE Japan - State of the Industry 2016

INDUSTRIAL REFRIGERATION - FROM JAPAN TO THE WORLD



RESIDENTIAL CO_2 HEAT PUMPS

Over 5 million EcoCute units are on the market today



Eco Cute (CO_2 heat pump) has been a run-away success, with strong government support

98% of all new residential HP water heaters

400-500k new units per year - 5 million+ in total

10 million expected by 2020

GUIDES TO NATURAL REFRIGERANTS

China 2015

China Business Directory 2015

Europe 2014

Japan 2016

North America 2015

SHECCO USEFUL LINKS

Industry Platforms:

www.hydrocarbons21.com

www.R744.com

www.ammonia21.com

www.R718.com

shecco Publications, incl. GUIDEs

http://publications.shecco.com

Accelerate Magazines:

www.accelerateEU.com/

www.accelerateNA.com/

www.accelerateJapan.com/

ATMOsphere conferences:

www.ATMO.org

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