GUIDE to Natural Refrigerants 2016

state of the industry Japan & in the world

ATMO sphere ASIA

solutions for asia

natural refrigerants

9 & 10 February, 2016 – Tokyo

Nina Masson, Deputy Managing Director

shecco

GUIDEs for natural refrigerants

China 2015

China Business Directory 2015

Europe 2014

North America 2015

GUIDE Japan 2016

1st -ever comprehensive GUIDE on market, technology & policy trends

overview and examples of Natural Refrigerant use in Japan and the world

as part of the Accelerate Japan magazine brand

feature chapters on: Light-Commercial Refrigeration, Commercial Refrigeration, Industrial Refrigeration, CO_2 Heat Pumps

GUIDE Japan 2016

supported by market leaders for NR in Japan

…. serving a variety of applications

current use of refrigerants in japan

industry survey for GUIDE Japan: the use of HFCs is still widespread

CO_2 is catching up - NH_3 and HC are on par

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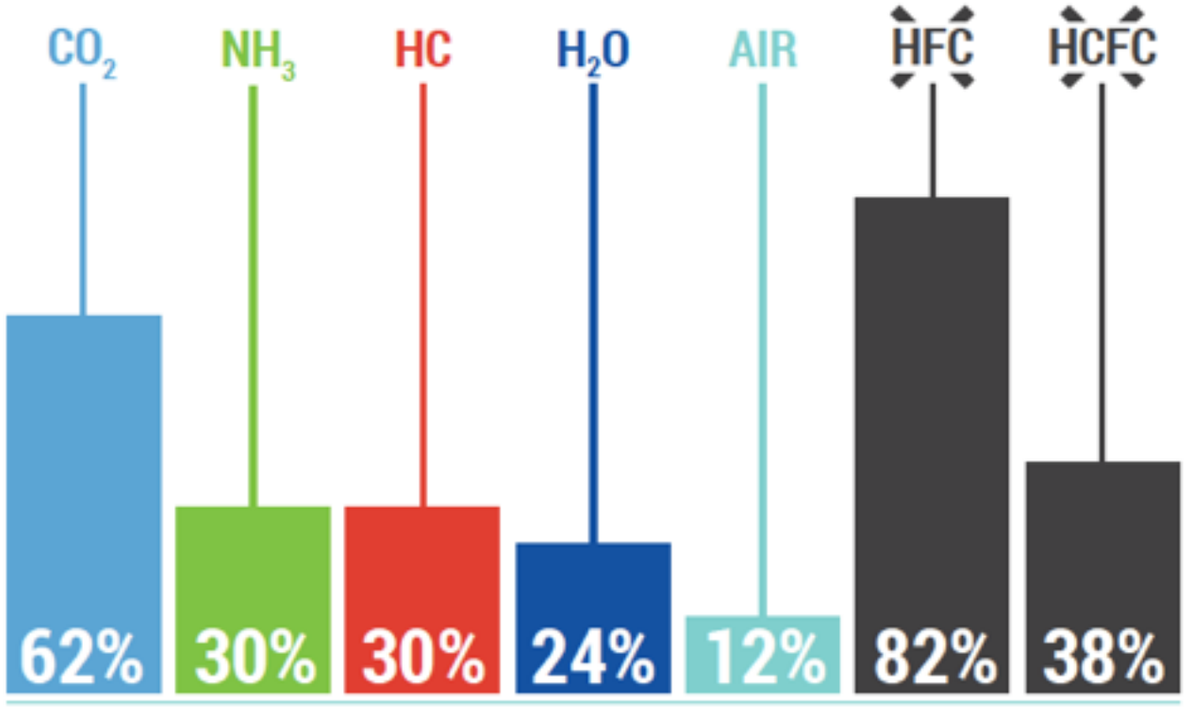
the “gap” between F-gases and Natural Refrigerants is shrinking



source: shecco, GUIDE Japan 2016

drivers for NR in japan

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

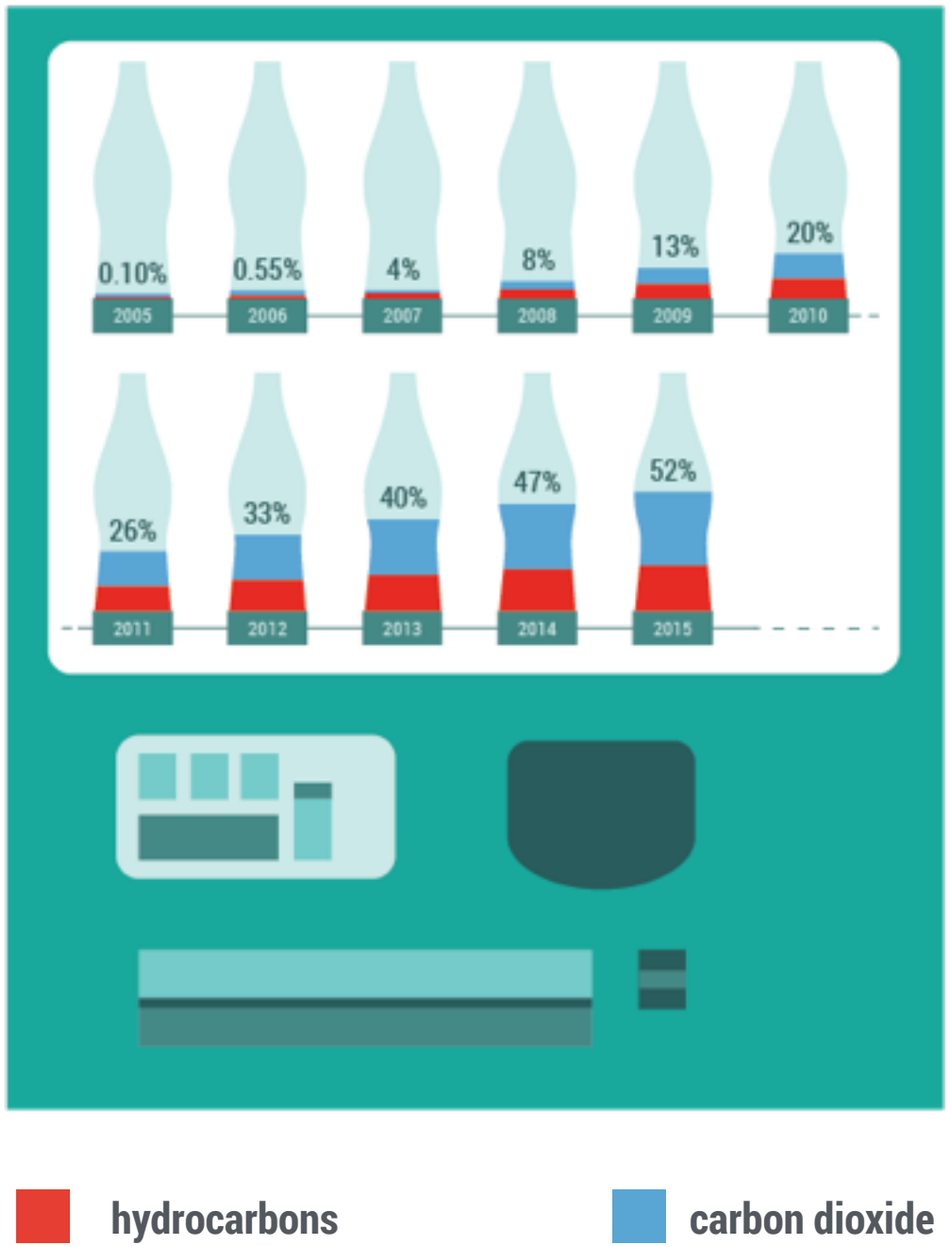
industry survey for GUIDE Japan: environmental benefits are the major reason for using NR in Japan

efficiency & performance, compliance with laws, and reliability are stronger drivers

the availability of qualified engineers and the capital cost are still considered the weakest drivers

= the drivers for NR in Japan are very similar ones to those in other countries

light-commercial refrigeration japan



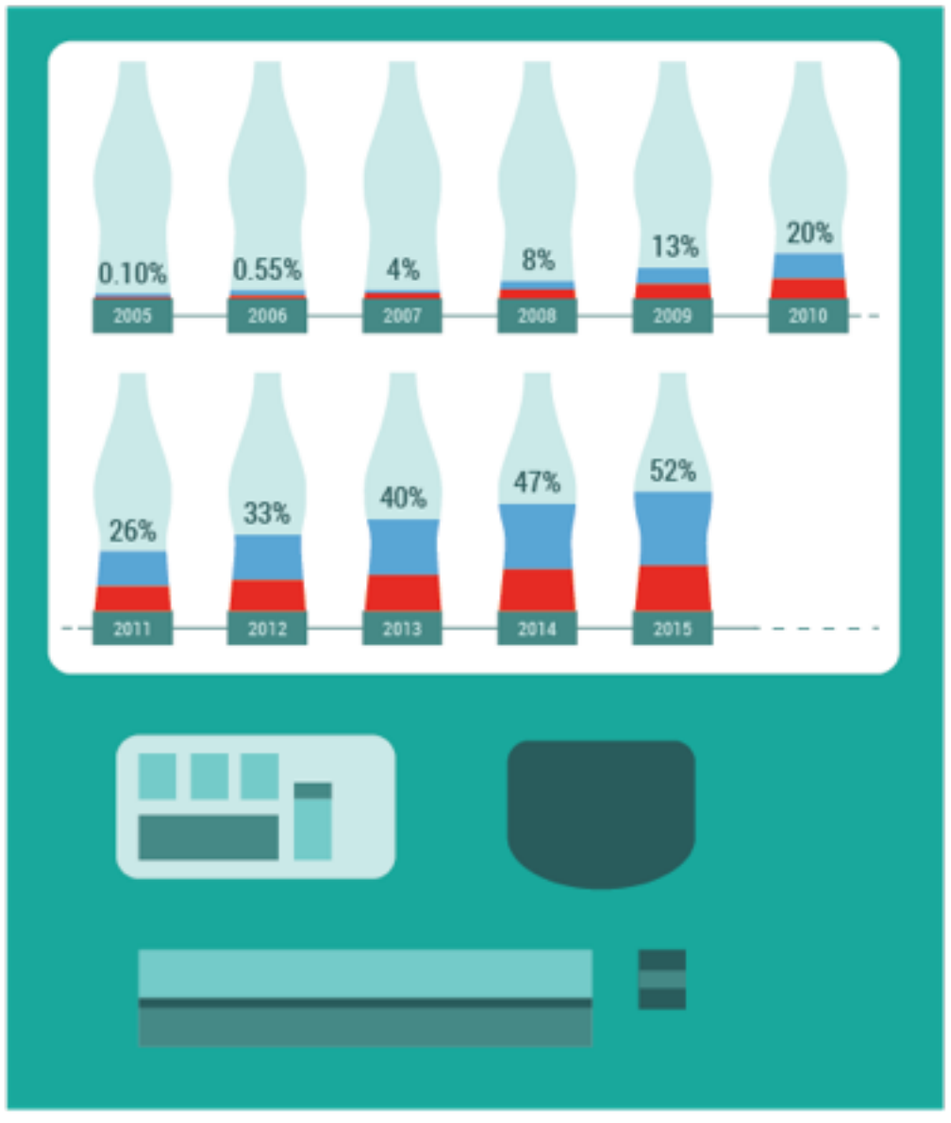
1.35 million beverage vending machines in Japan use either hydrocarbons or CO_2

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

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

light-commercial refrigeration japan

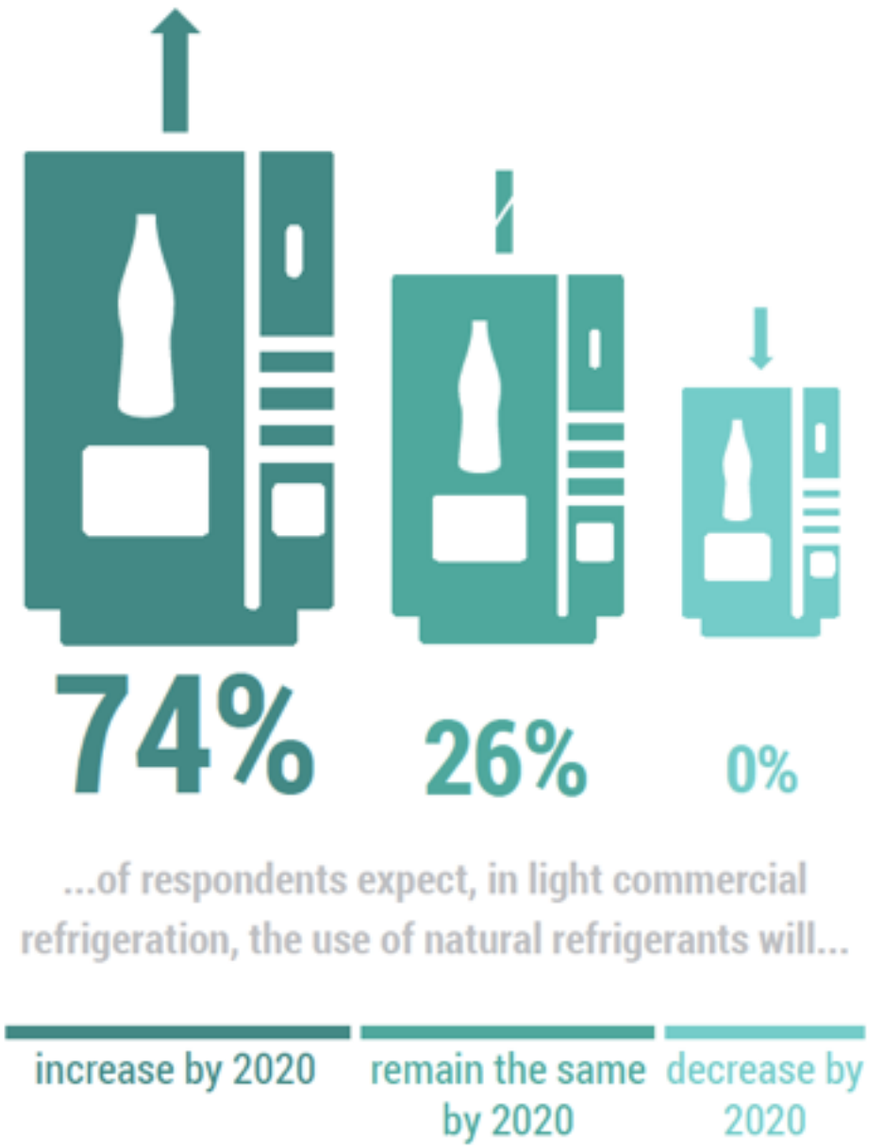


source: shecco, GUIDE Japan - State of the Industry 2016

with the world's highest number of beverage vending machines per capita the use of NR in this sector will continue to have a significant impact on the overall market

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)

light-commercial refrigeration japan

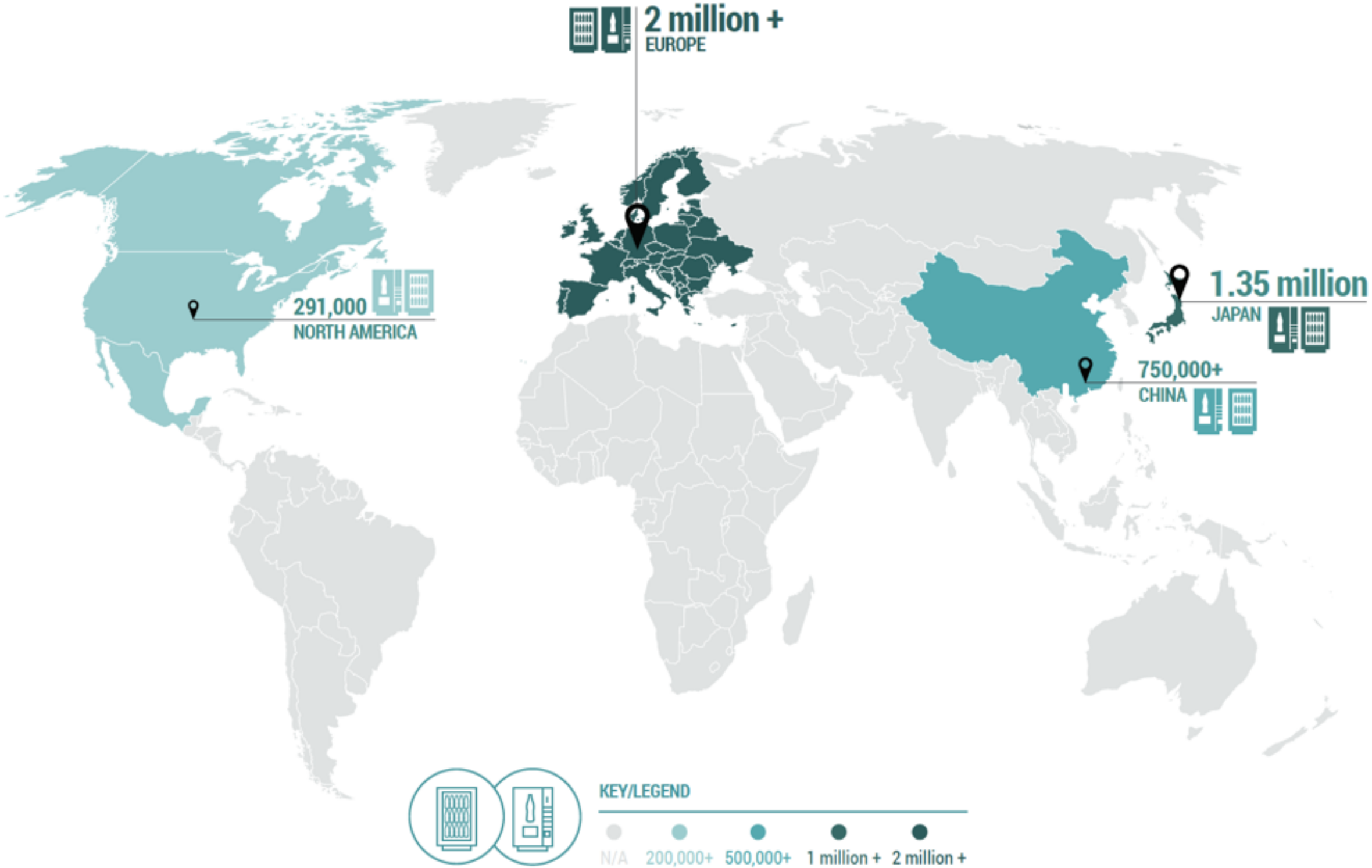


industry survey for GUIDE Japan: nearly 3/4 expect natural refrigerants to grow in this sector until at least 2020

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

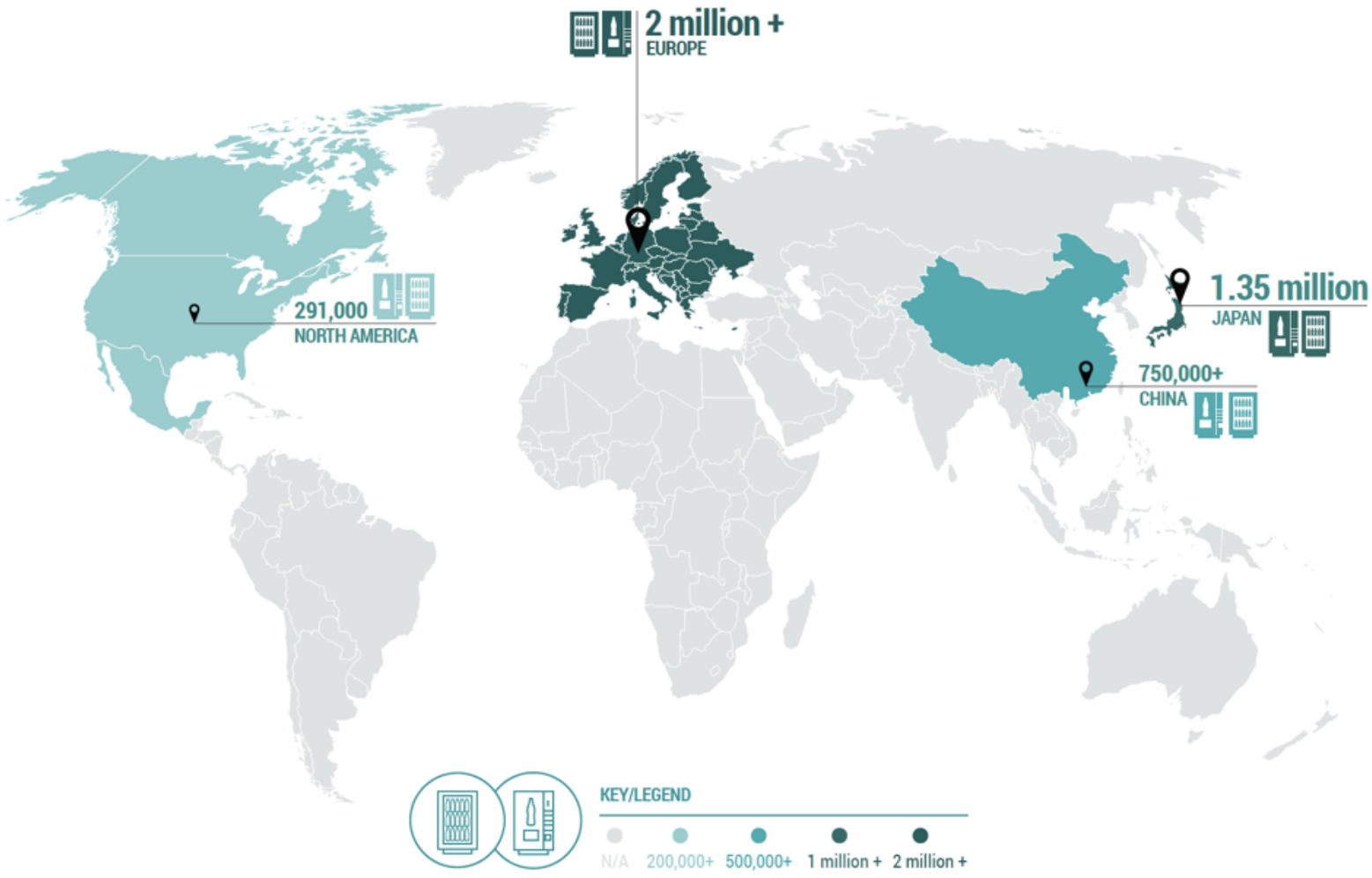
source: shecco, GUIDE Japan - State of the Industry 2016

HFC-free light-commercial refrigeration global



source: shecco, GUIDE Japan 2016, GUIDE North America 2015, GUIDE China 2015

HFC-free light-commercial refrigeration global



more than 4.5 million HFC-free units worldwide

North America has more than 291,000 HFC-free units - 181,000 HC + 109,000 CO_2 = 17 times more than 3 years ago

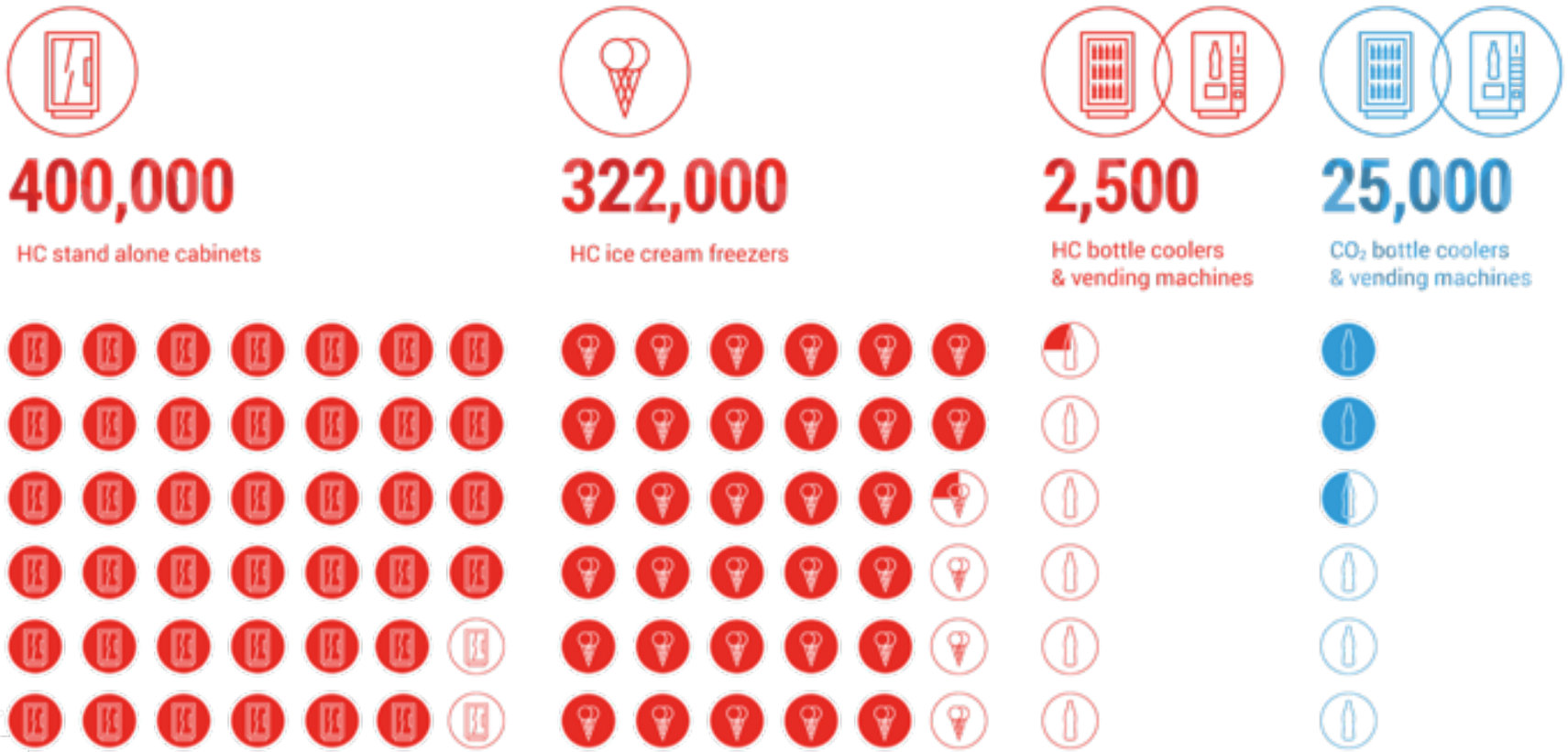
strong trend for HC use in food service

Europe has more than 2 million HFC-free units (also in ice cream freezers, bottle coolers etc.) - mostly HC use for plug-in systems

use of HC also in refrigeration for food retail

source: shecco, GUIDE Japan 2016, GUIDE North America 2015, GUIDE China 2015

light-commercial refrigeration in china



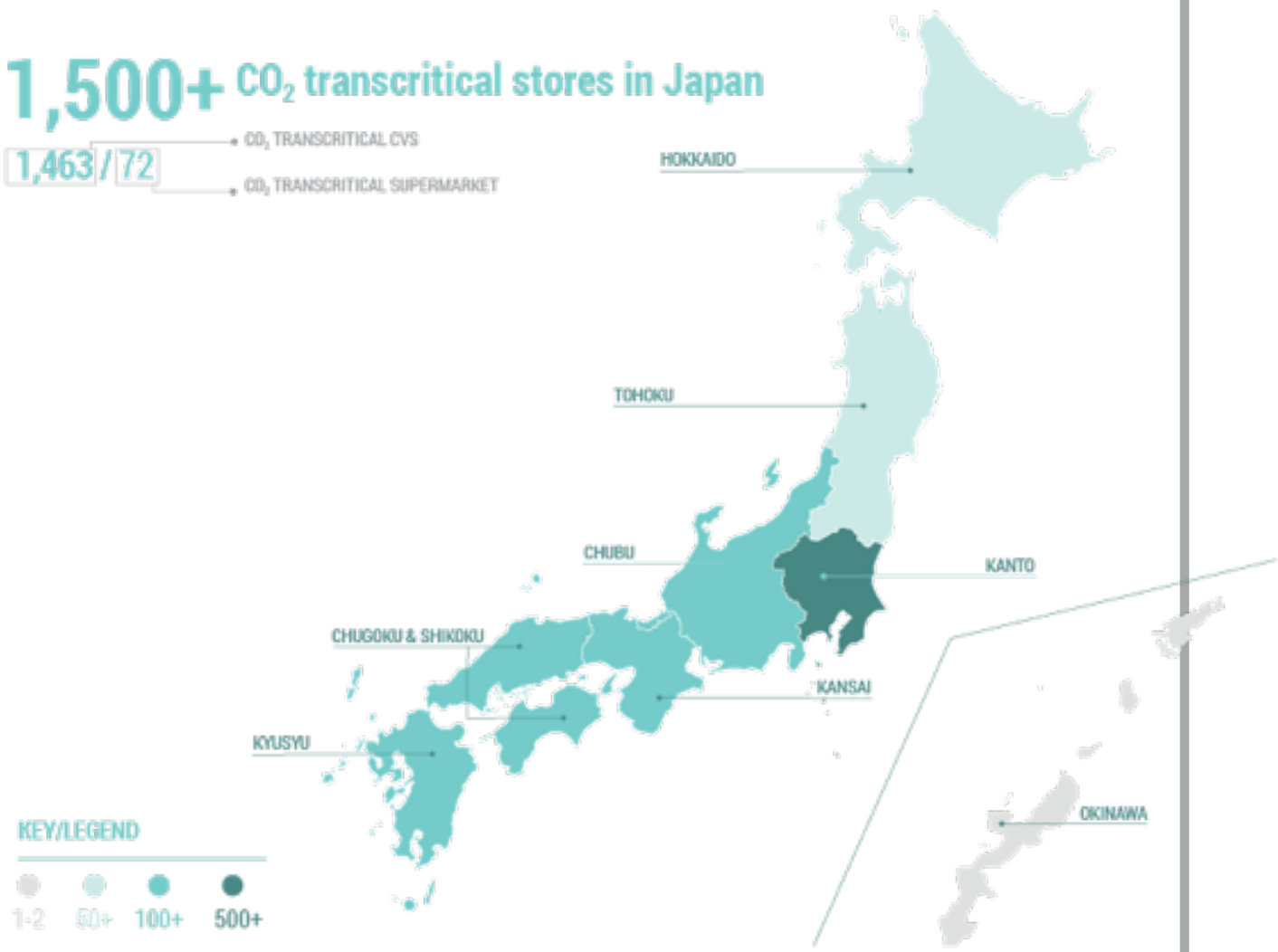
at least 750,000 HFC-free units are placed in China today - global brands fast-track the use

85% of the Chinese industry expects an increase in NR use for that sector by 2020

the outlook for HC is rated slightly more positively than for CO_2

source: GUIDE to Natural Refrigerants in China - State of the Industry 2015, status: May 2015

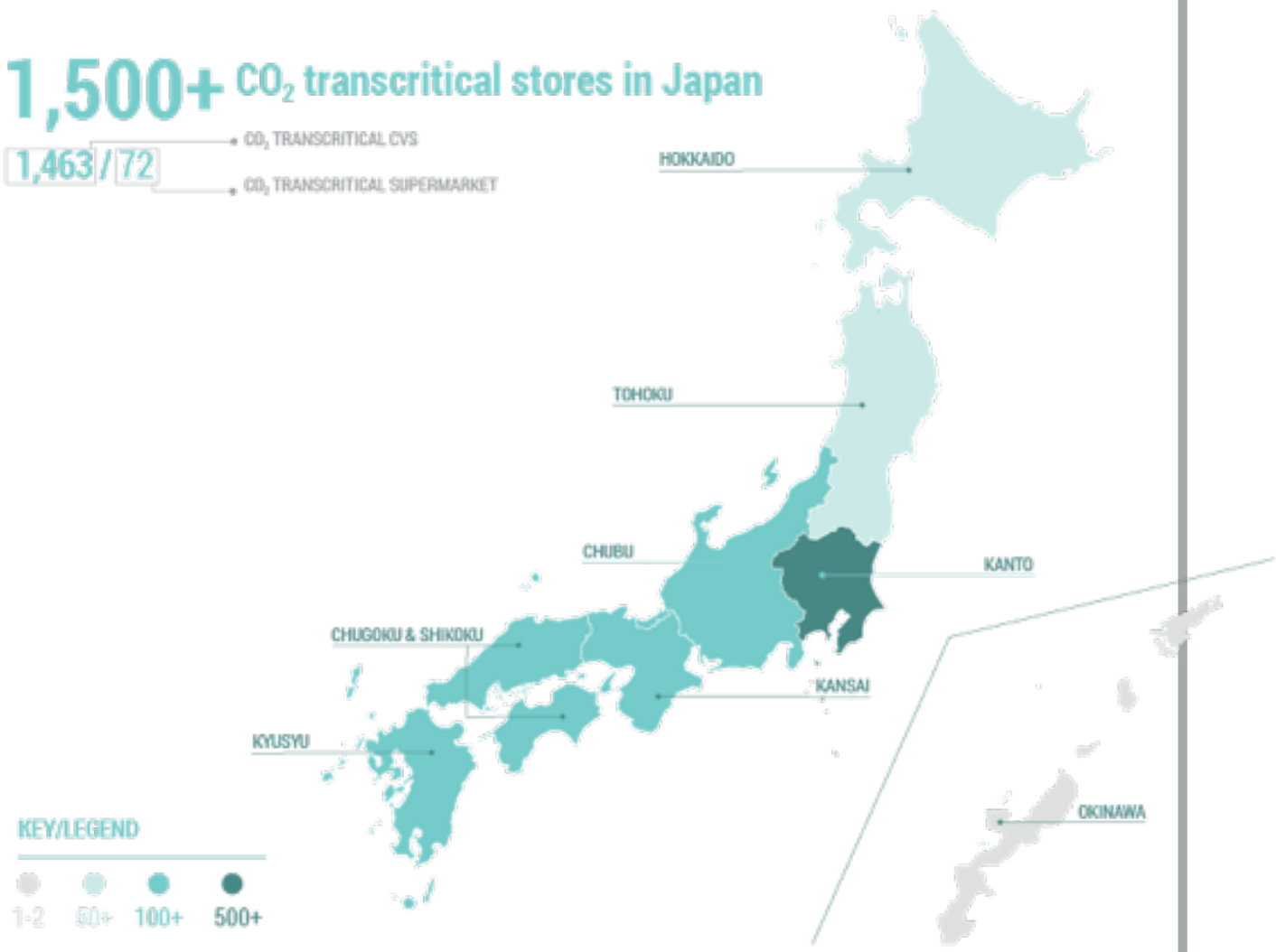
CO_2 stores in japan



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

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

CO_2 stores in japan



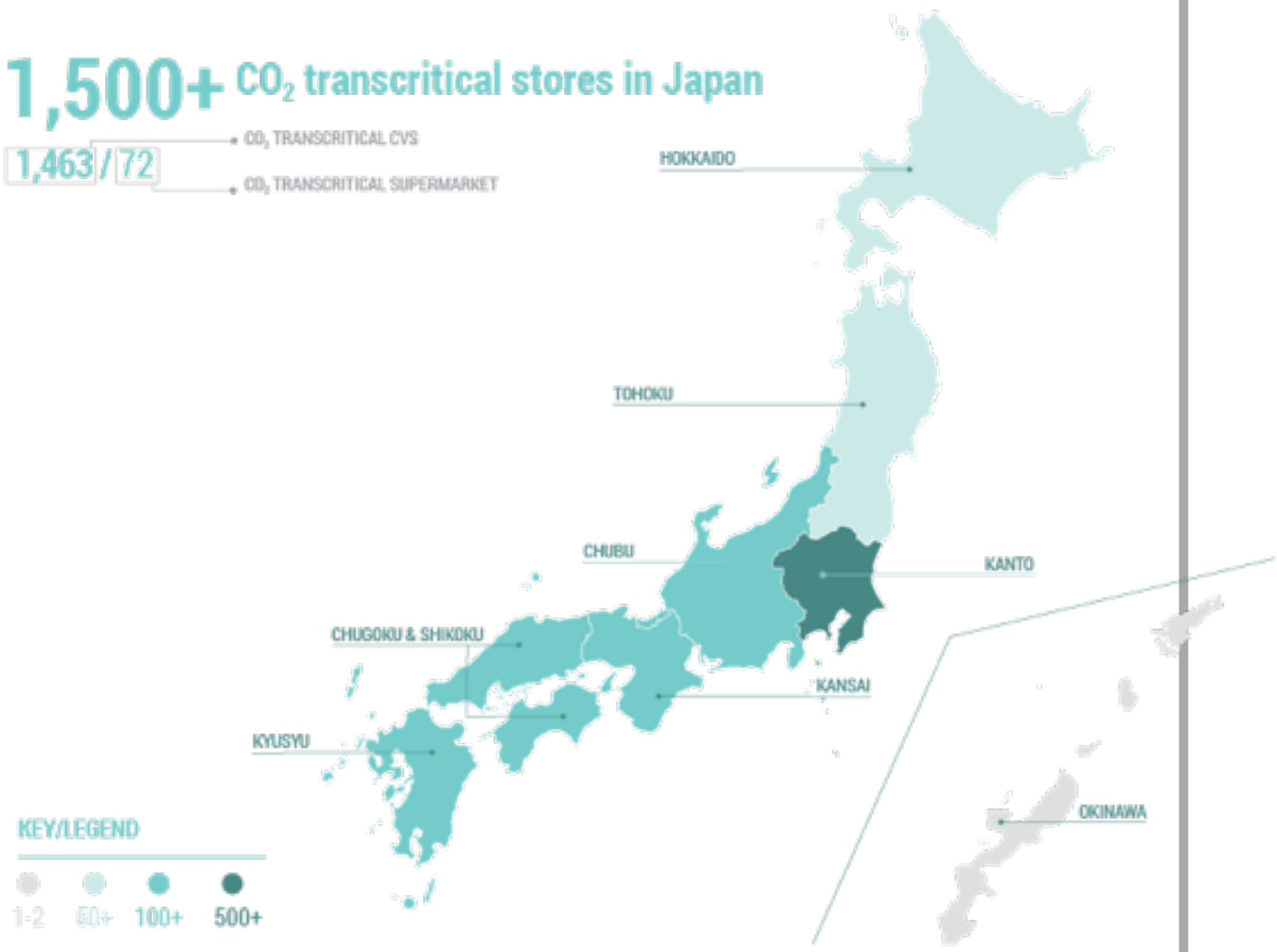
out of that 1,463 are small CVS which use less than 10 kW

= 4% of stores from Japan's three leading CVS brands

BUT: only 72 supermarkets have CO_2 TC refrigeration - one reason: the High Pressure Gas Safety Act slows down their use in larger systems = major market barrier to remove

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

CO_2 technology from japan

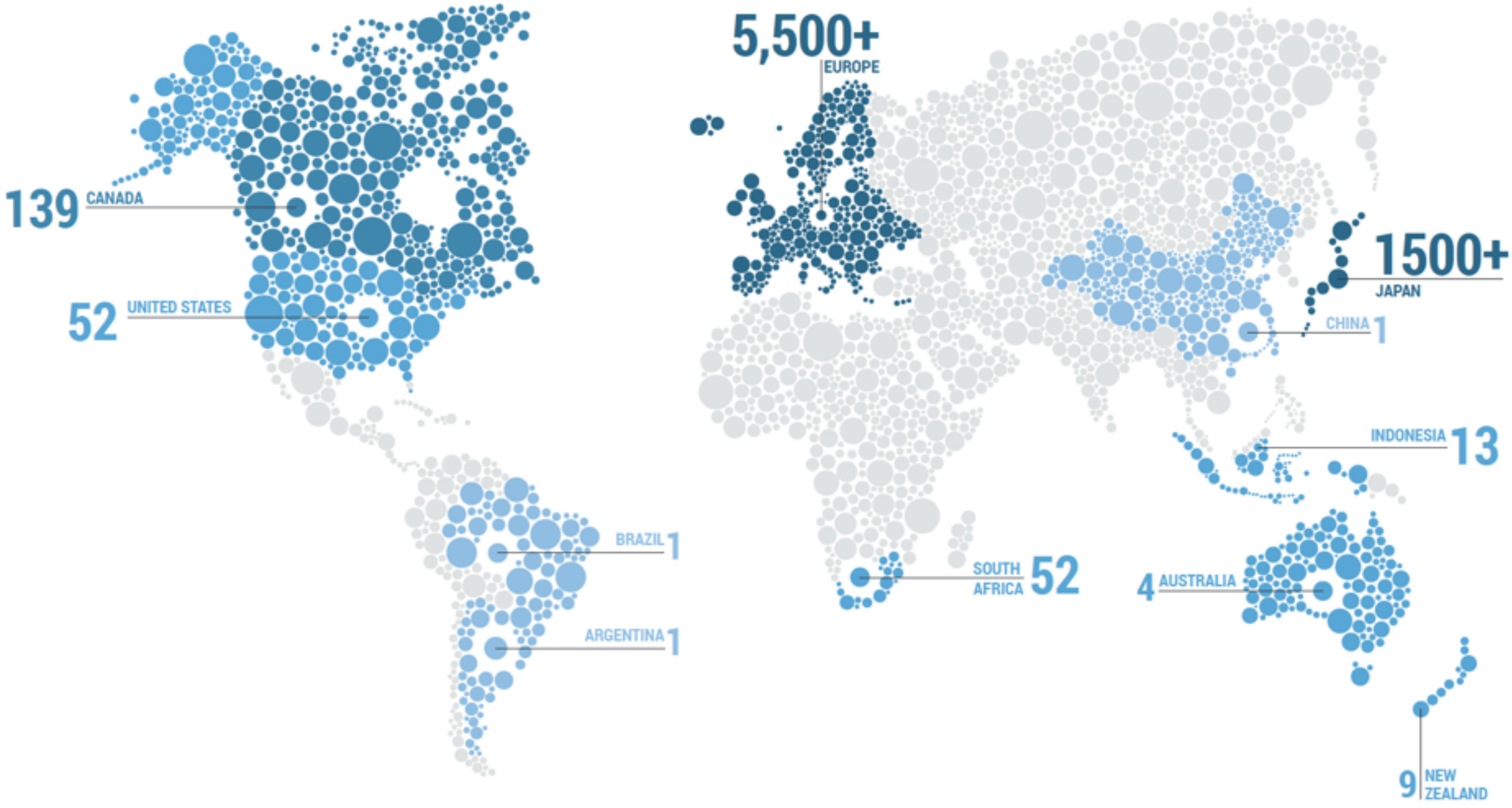


source: shecco, GUIDE Japan - State of the Industry 2016

next trend: exporting Japanese CO_2 technology to Indonesia, Taiwan, South East Asia …

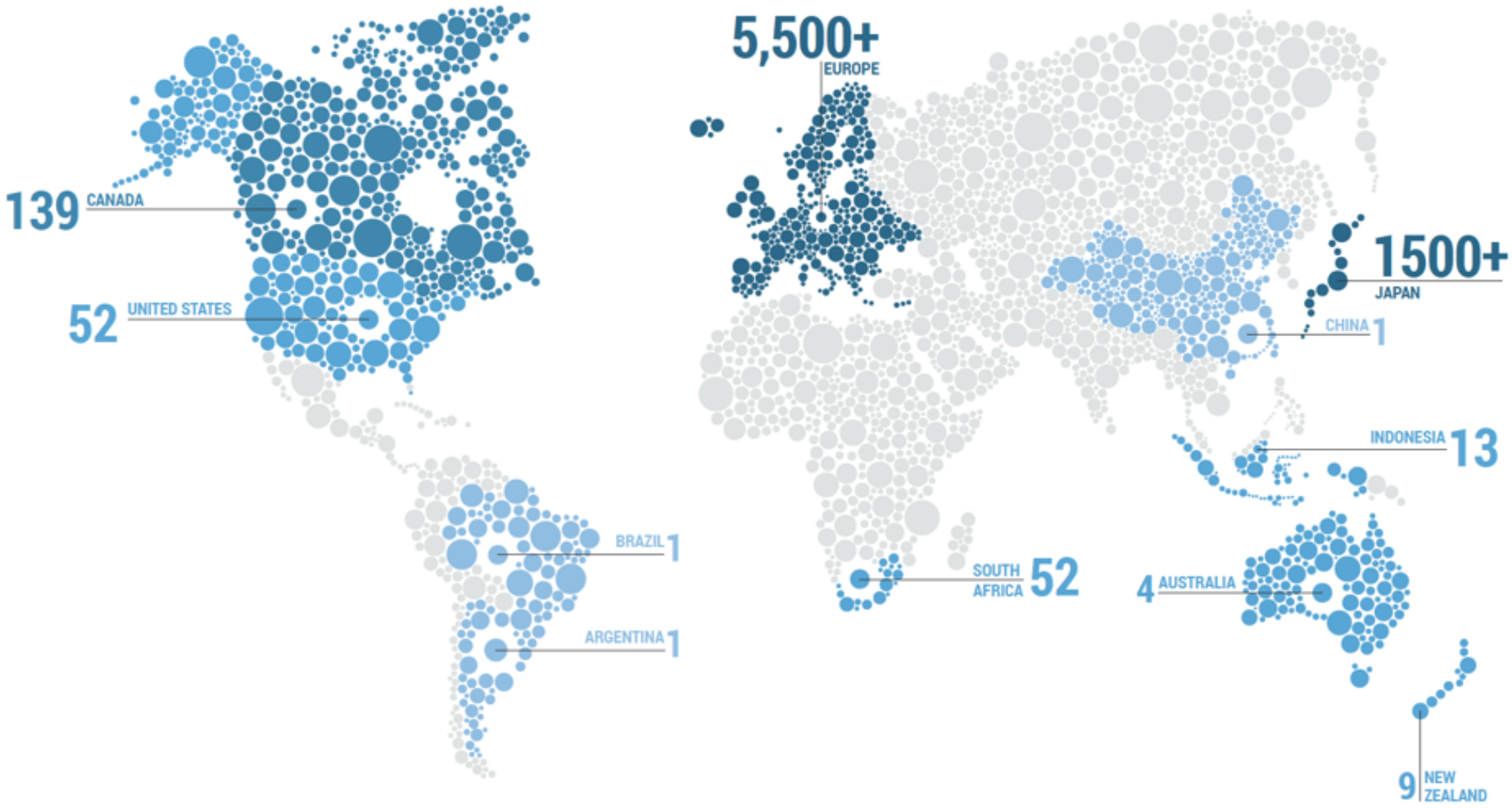
and to other world regions, especially Europe where there is a real need for CVS refrigeration systems with natural refrigerants

CO_2 transcritical stores in the world



source: shecco, status: February 2016

CO_2 transcritical stores in the world



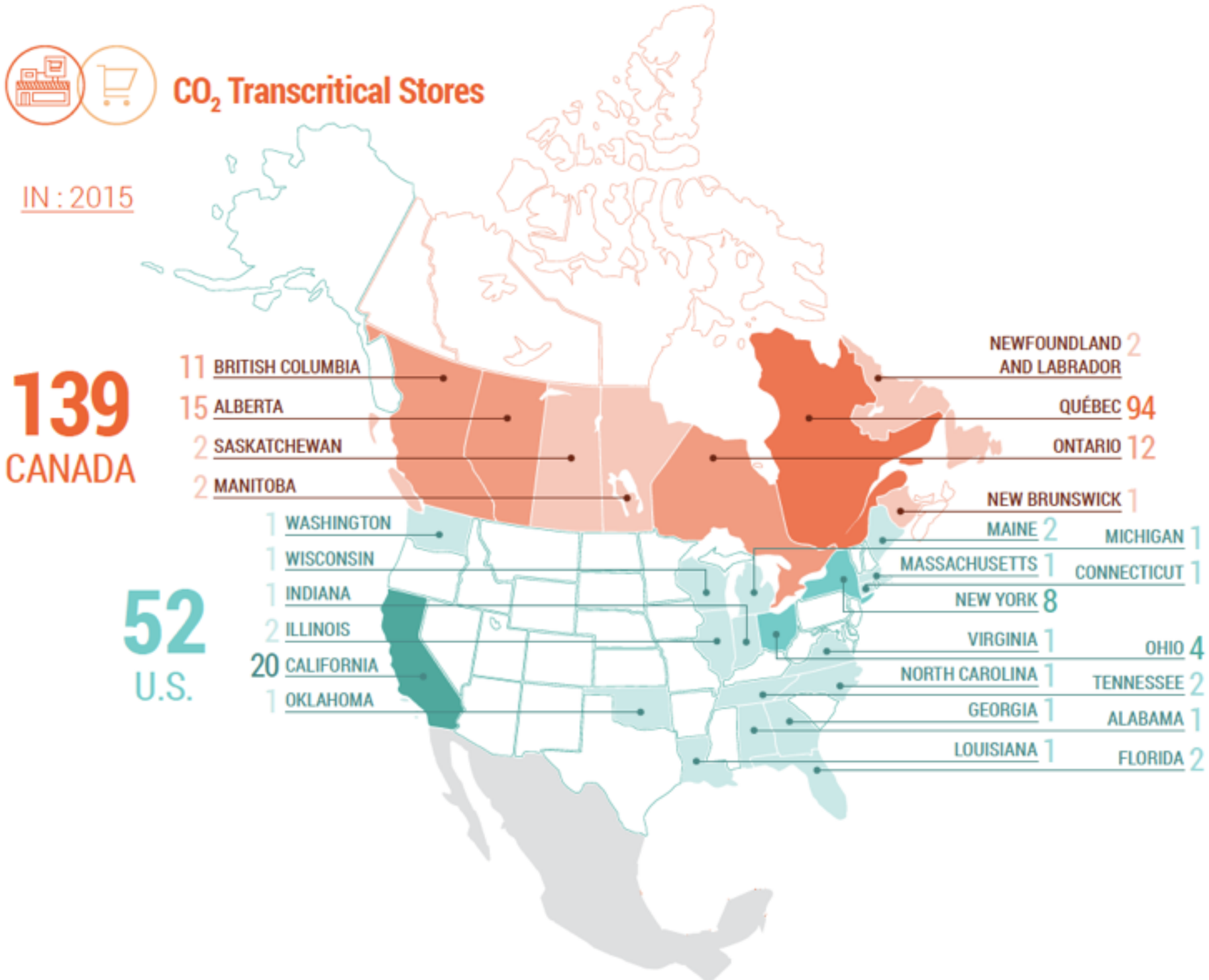
three hot spots have emerged: europe, asia (mostly japan) and north america

… with different technology focus (CO_2 TC vs. CO_2 cascade), store formats (large vs. CVS) & retailer commitment

south africa and indonesia stand out … again as a result of individual food retailers' drive to go CO_2

source: shecco, status: February 2016

CO_2 transcritical stores North America



source: shecco, status: August 2015

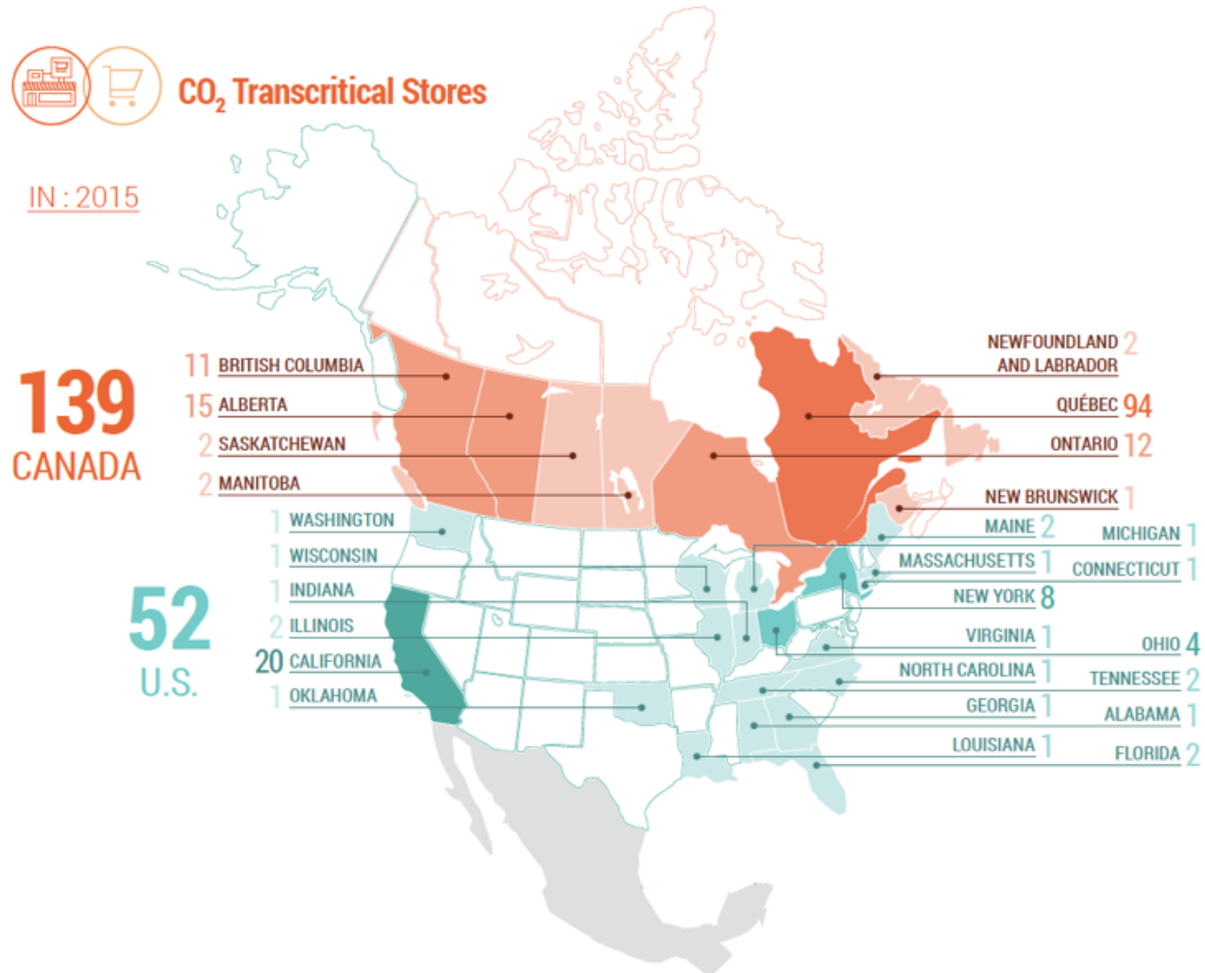
CO_2 transcritical stores North America

with approx. 200 CO_2 TC stores North America is still an emerging market

the further south the less CO_2 TC systems are installed - higher share of CO_2 cascade solutions in the south

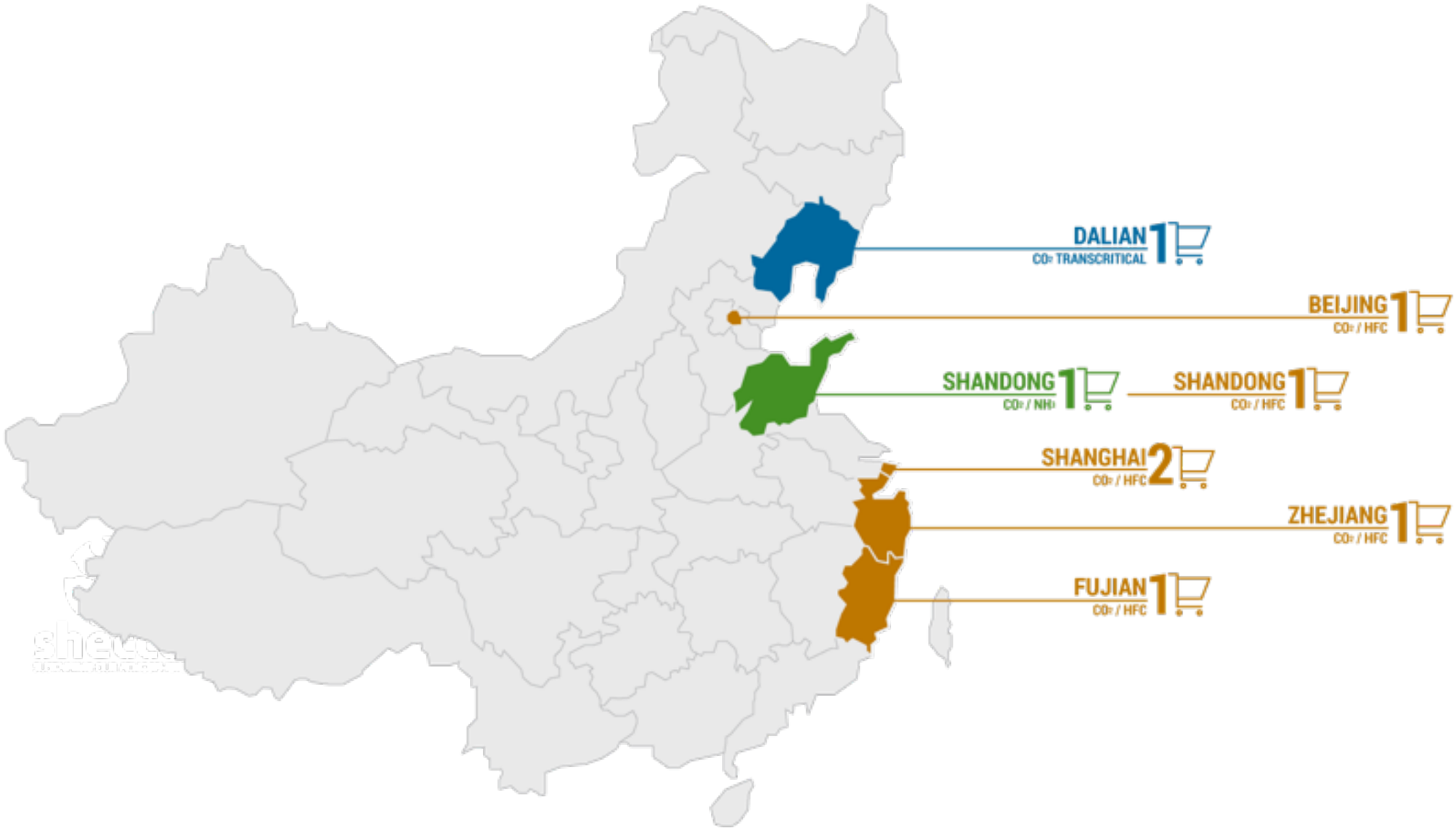
next big challenge is CO_2 TC use in warmer ambient temperatures

opportunities for Japanese companies to enter the North American market for CO_2 solutions



source: shecco, status: August 2015

CO_2 stores in china



source: shecco, status: May 2015

CO_2 stores in china

8 CO_2 stores in China - 1 TC

2015/16: min 17 CO_2 hybrid stores planned (Metro)

NR uptake is driven by global food retail brands - now: Tesco, Metro

80% of components for CO_2 refrigeration systems now available in China

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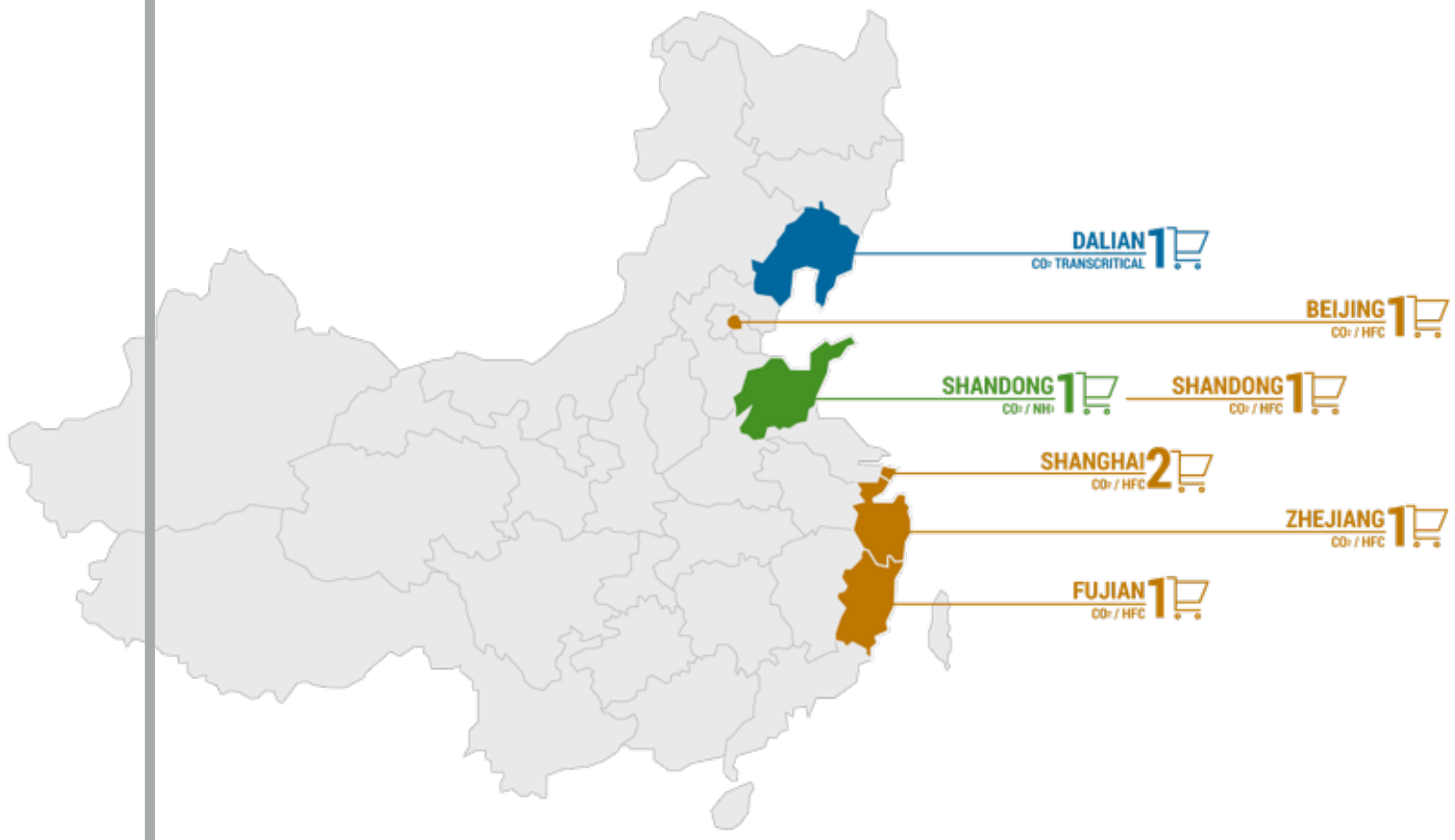
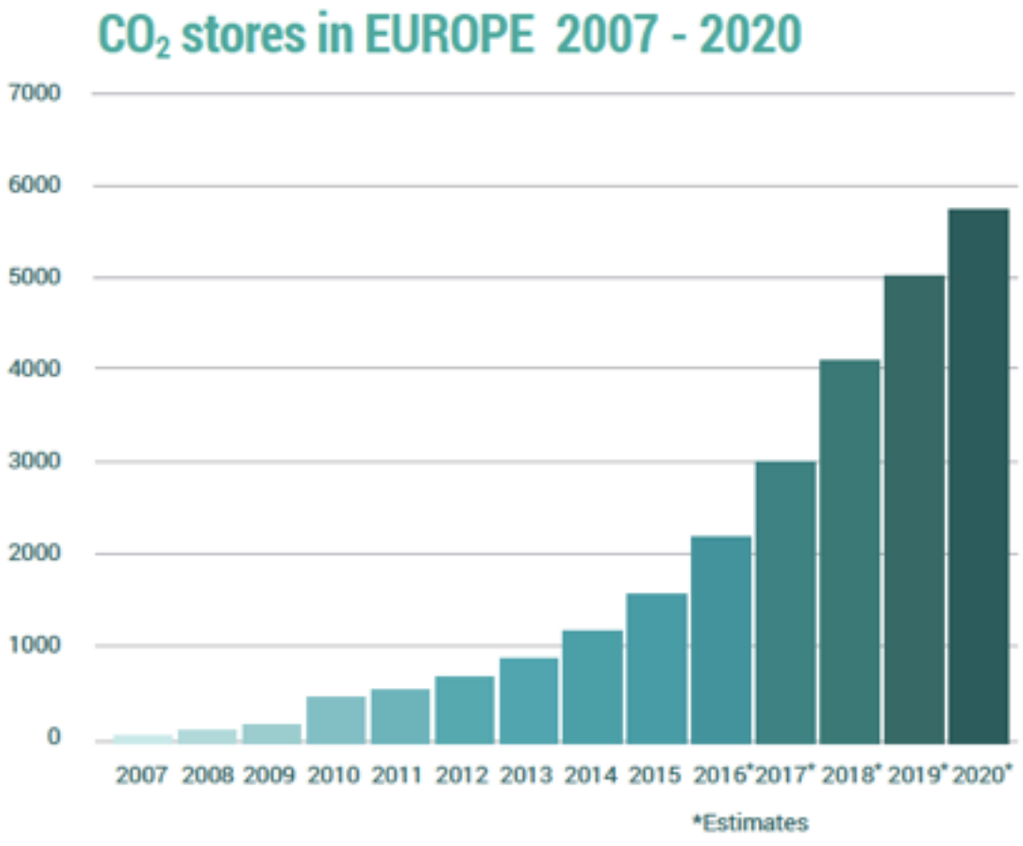
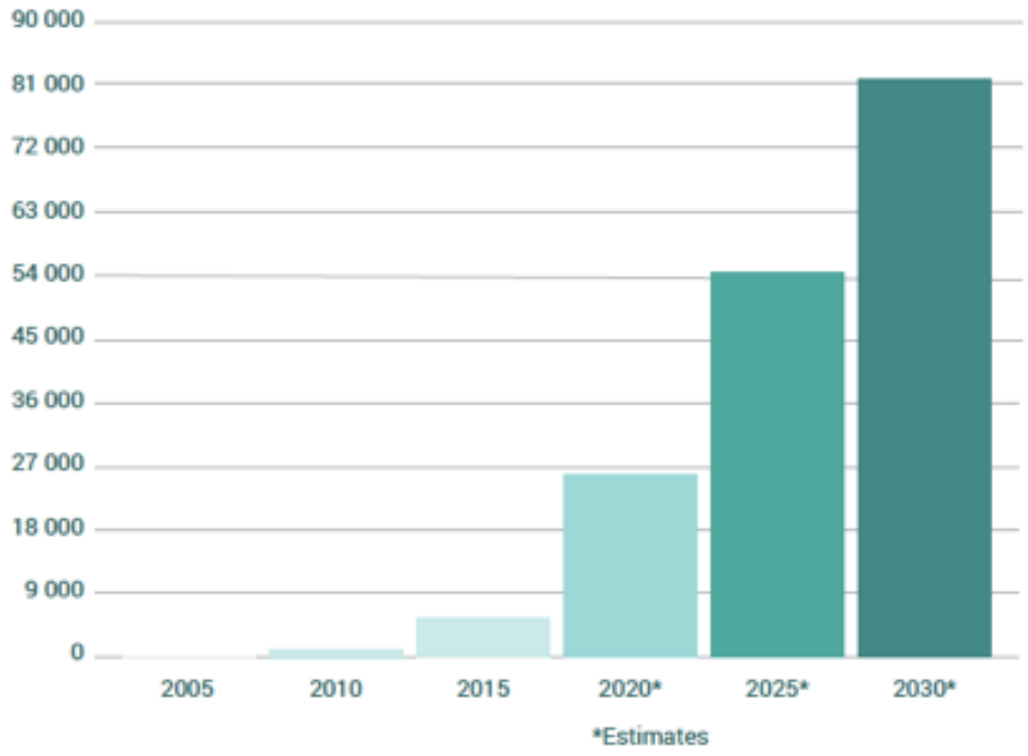
CO_2 is still in the developing stage… but is expected to gain traction in the next few years



source: shecco, status: May 2015

CO_2 transcritical stores europe 2007-2030





europe as the world's largest market for CO_2 TC supermarkets with growth rates of 25-35% in the last few years

the F-Gas Regulation will further push the market (2022 ban on GWP higher 150 in centralised systems) - expected peak in adoption around 2018-2020

total number of CO_2 stores could reach 81,000+ by 2030 (assumes it will also enter smaller stores / CVS)

source: shecco, status: February 2016

why the choice of large retailers matters

the market share of the top 5 food retailers per country will increase, leading to a concentration of the market

a 2014 shecco survey among large food retailers in North and West Europe showed 83% already used CO_2 refrigerant in centralised systems

the growth of hypermarkets will slow down, but convenience stores will grow for the next years = more standardised solutions will be needed also for refrigeration systems

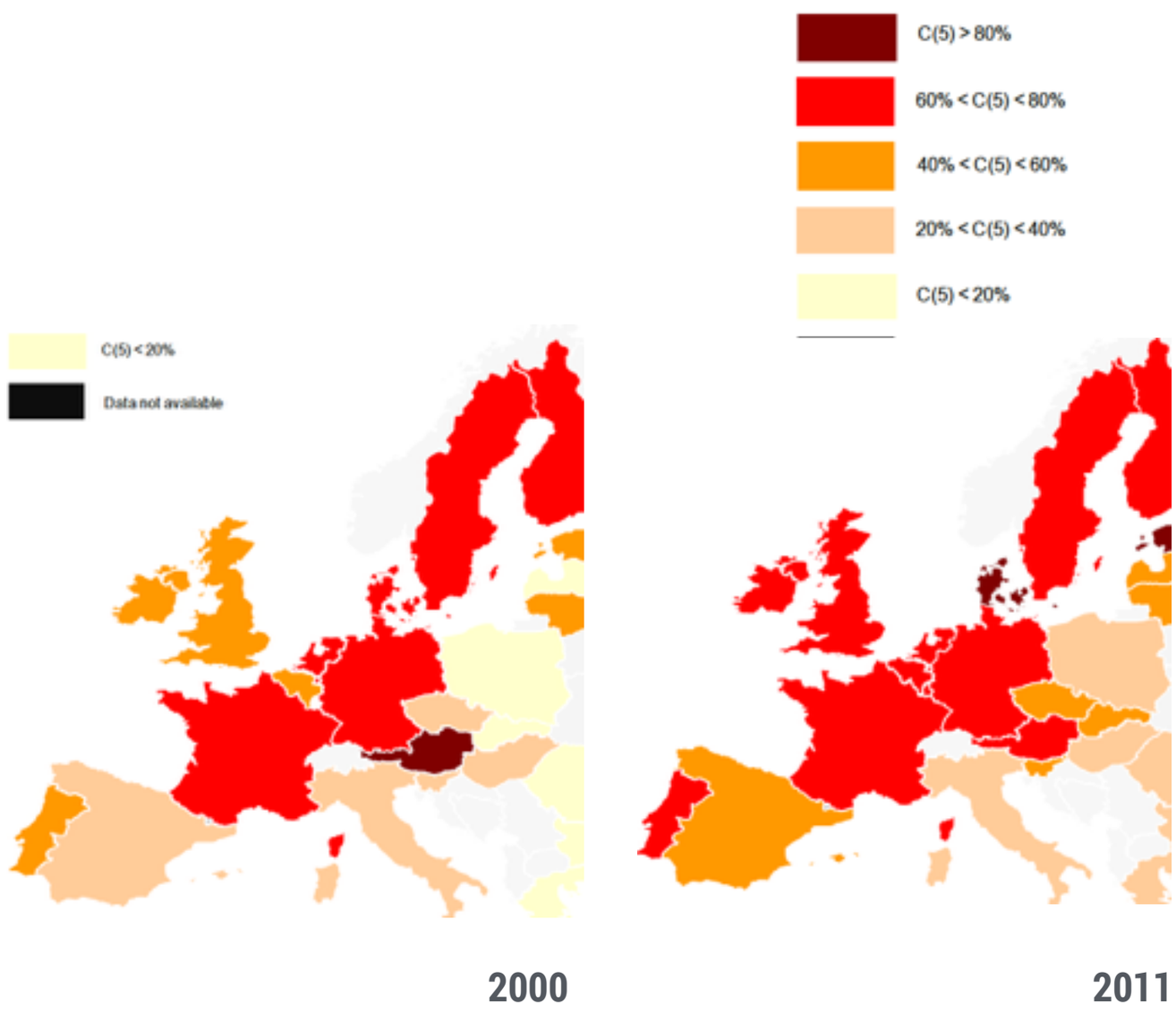
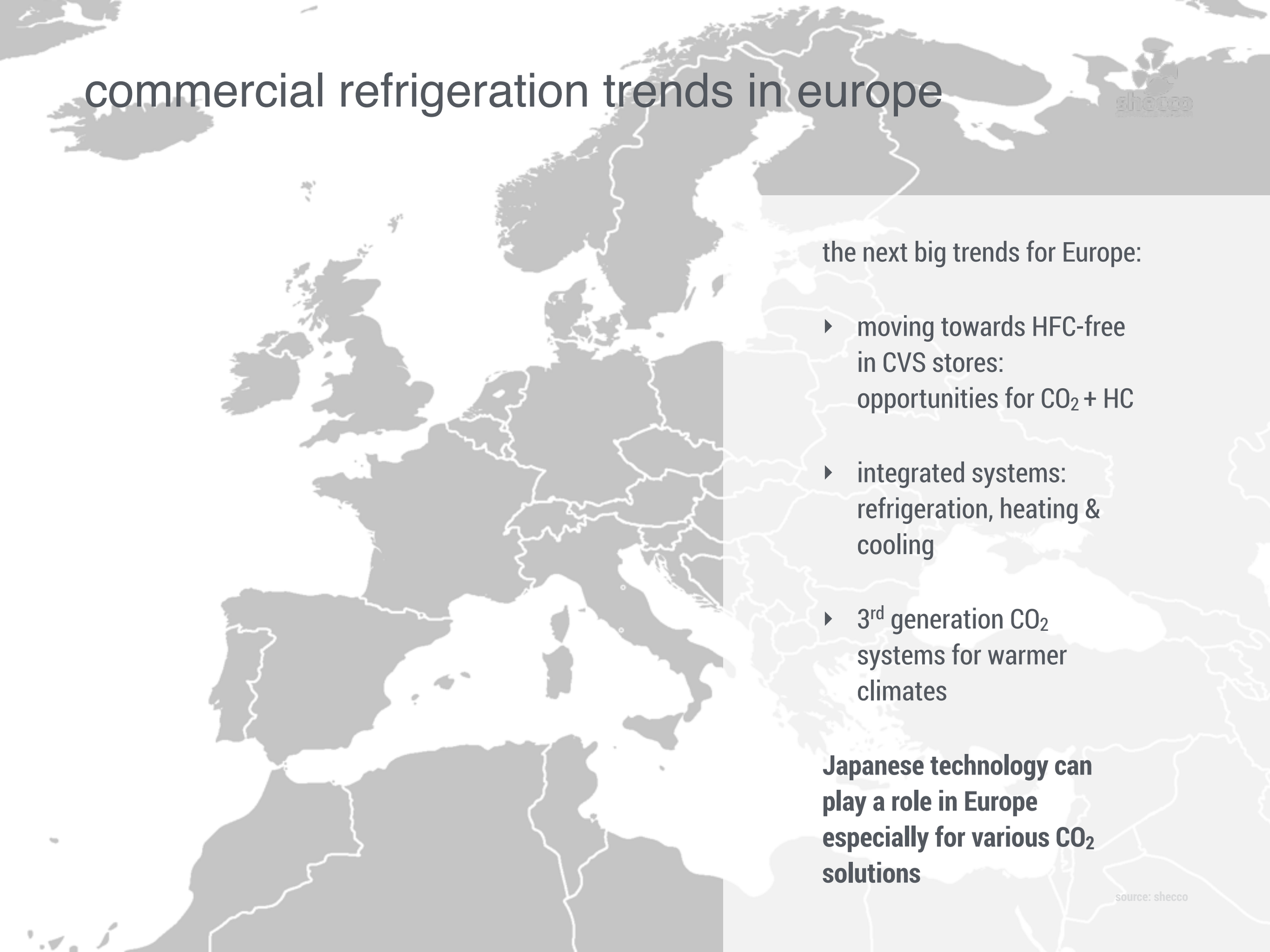


image source: Planet Retail

commercial refrigeration trends in europe



the next big trends for Europe:

- moving towards HFC-free in CVS stores: opportunities for CO_2 + HC
- integrated systems: refrigeration, heating & cooling
- 3rd generation CO_2 systems for warmer climates

Japanese technology can play a role in Europe especially for various CO_2 solutions

source: shecco

industrial refrigeration in japan

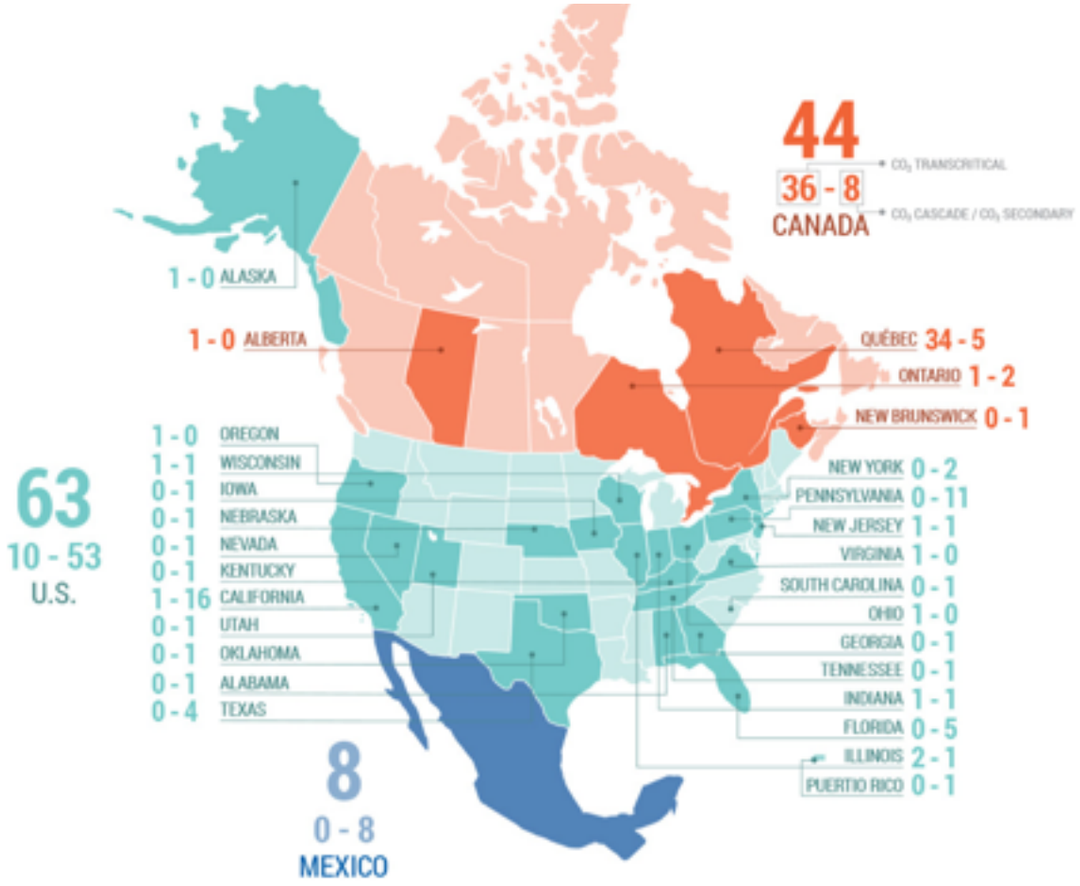
the market is changing, from a strong reliance on R22 to a renewed uptake of (lower charge) NH_3 systems

secondary NH_3-CO_2 systems offer a solution

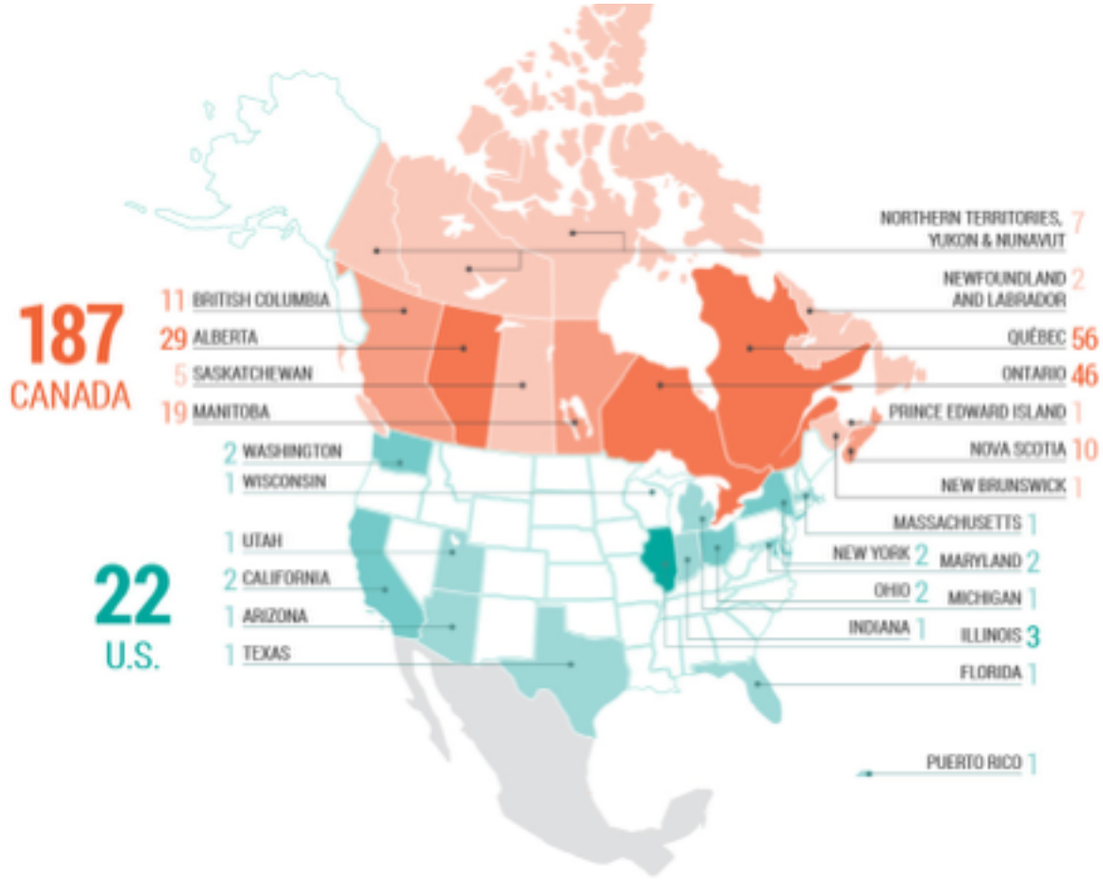
BUT: the use of CO_2 transcritical systems still faces restrictions through the High Pressure Gas Safety Act (an emerging trend in other world regions)

next-generation refrigeration systems in NA

CO_2 TC industrial refrigeration systems



NH_3 low-charge industrial refrigeration systems



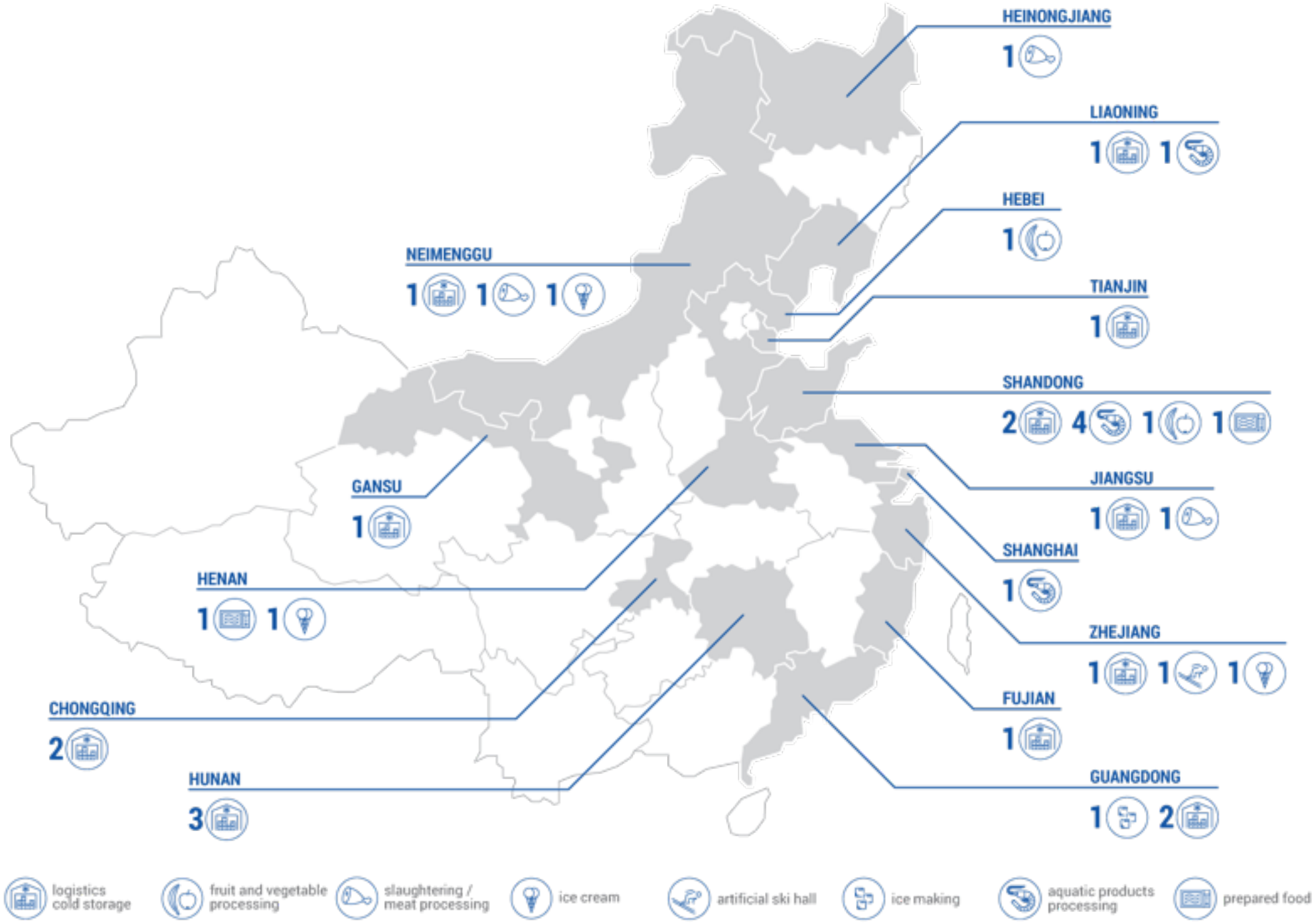
source: shecco, status: Aug 2015

Canada leading on the use of CO_2 TC systems, whereas the USA is leading on the use of CO_2 cascade/secondary systems

HCFC phase-out has created new opportunities for NR

the use of NH_3 low charge systems and “packaged” solutions has increased in the last years

industrial refrigeration - CO_2 projects in china



source: GUIDE to Natural Refrigerants in China - State of the Industry 2015, status: May 2015

industrial refrigeration - CO_2 projects in china

more than 30,000 end-users
use NH_3 systems

by 2017, China will most likely surpass the capacity of the US cold chain, currently at 115 million m^3 of space

by end-2015, 34 CO_2 cascade / secondary projects were expected to be complete in China's industrial refrigeration sector

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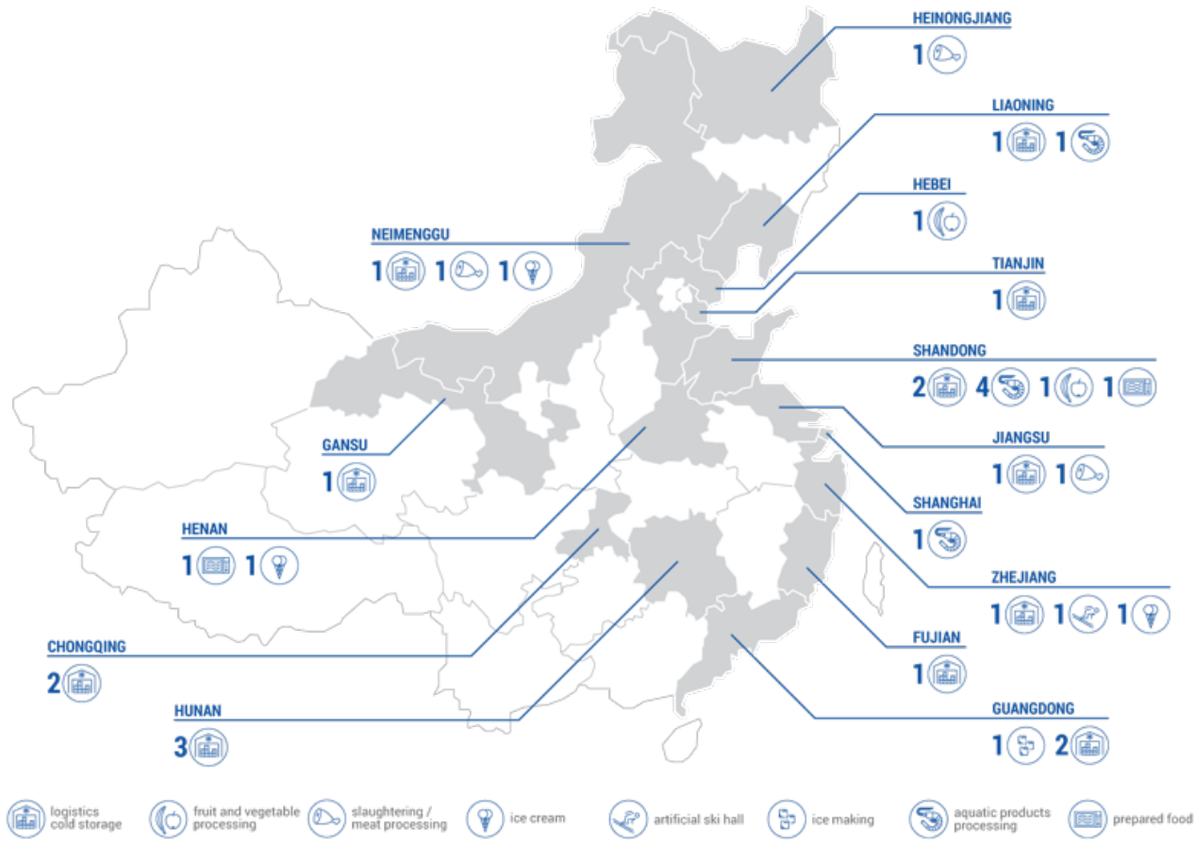
NH_3 and CO_2 in industrial refrigeration were ranked 2nd and 3rd most promising ones out of 11 applications



source: GUIDE to Natural Refrigerants in China - State of the Industry 2015, status: May 2015

trend 1: growth sectors for NR in japan

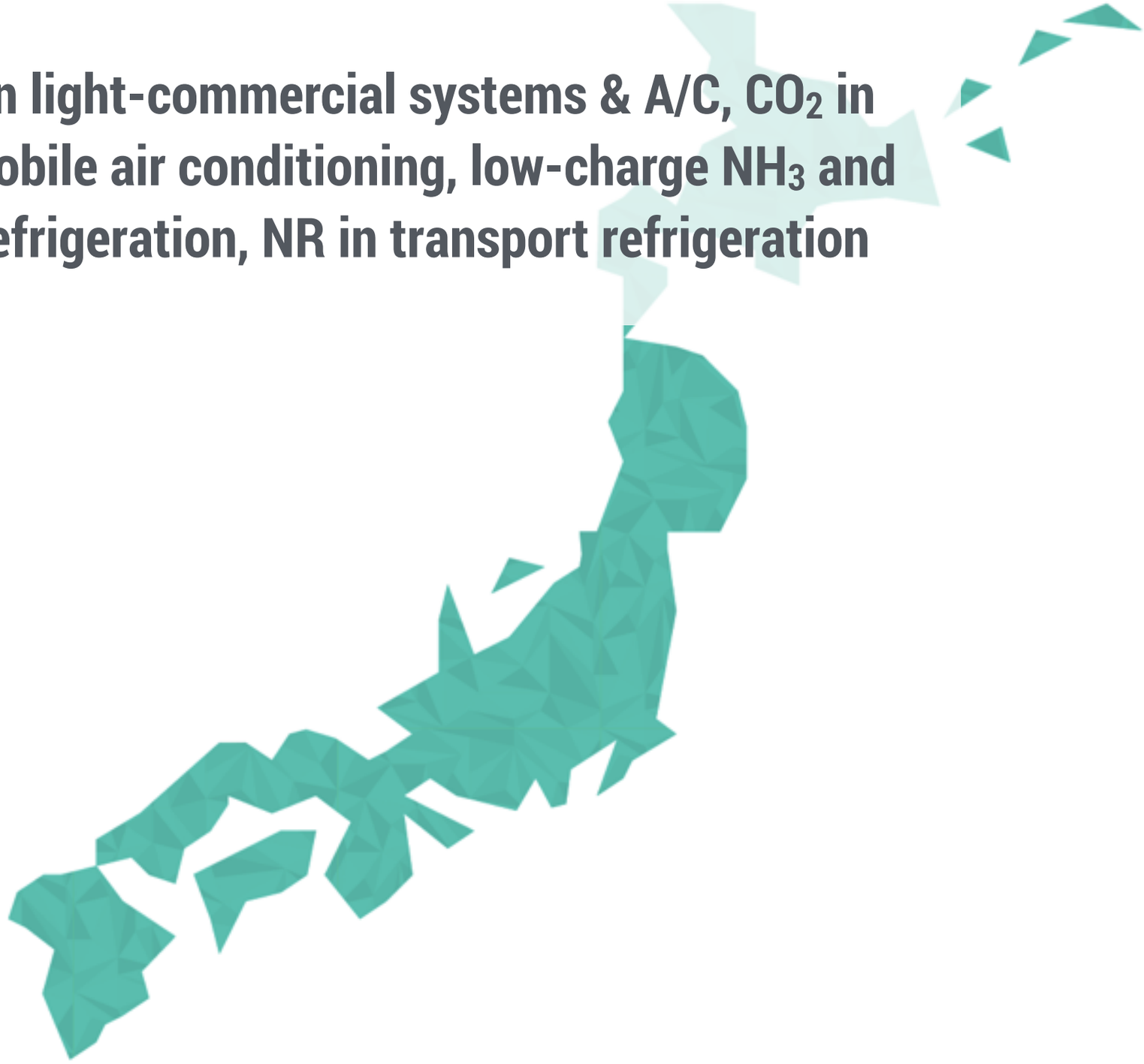
the use of CO_2 in (light-)commercial refrigeration and heat pumps, NH_3-CO_2 industrial refrigeration will continue

trend 2: potential for more NR in japan

future potential: moving towards next-generation NR integrated systems in CVS and supermarkets = “all-natural” stores

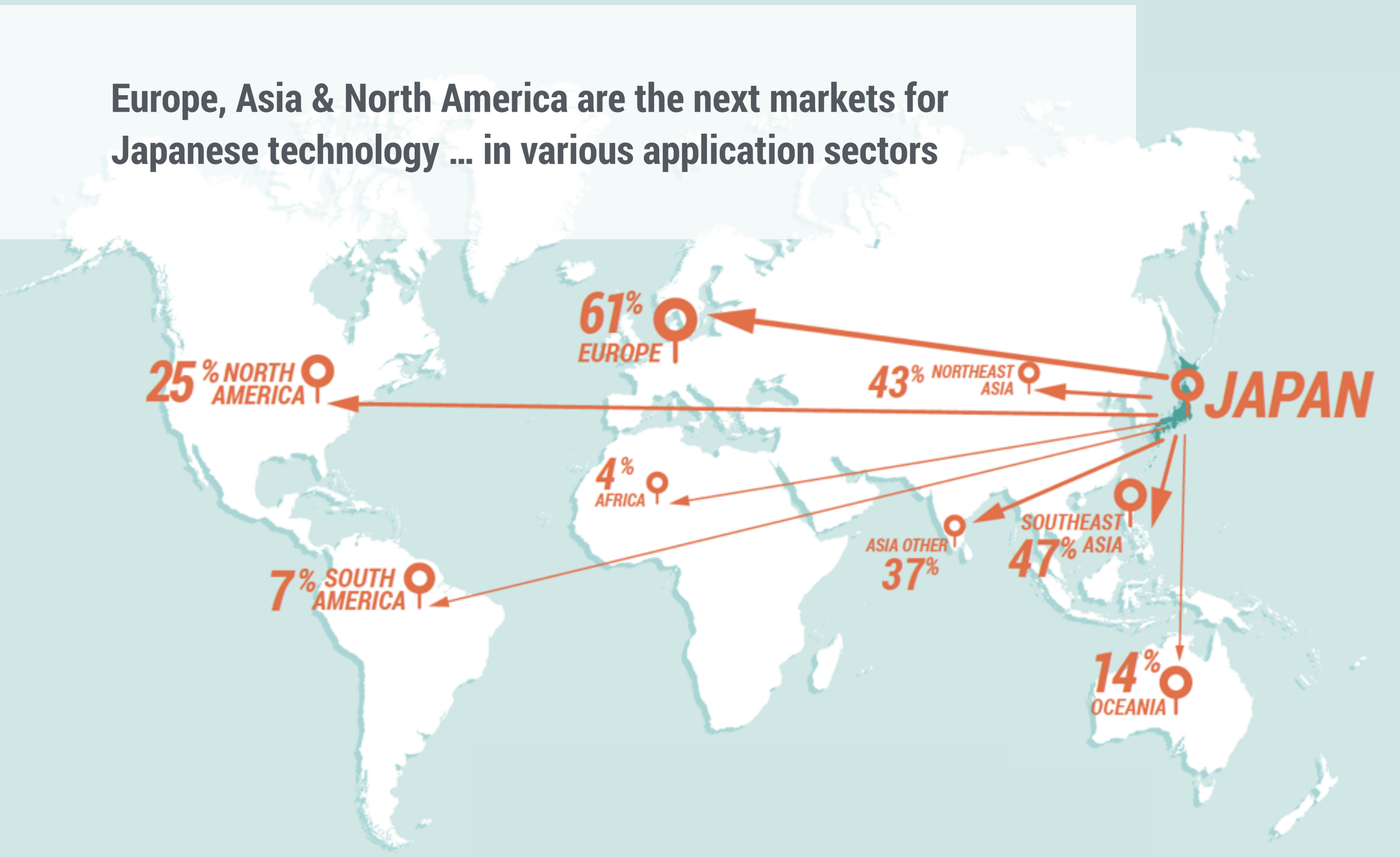
trend 2: potential for more NR in japan

future potential: HC in light-commercial systems & A/C, CO_2 in supermarkets, CO_2 mobile air conditioning, low-charge NH_3 and CO_2 TC in industrial refrigeration, NR in transport refrigeration



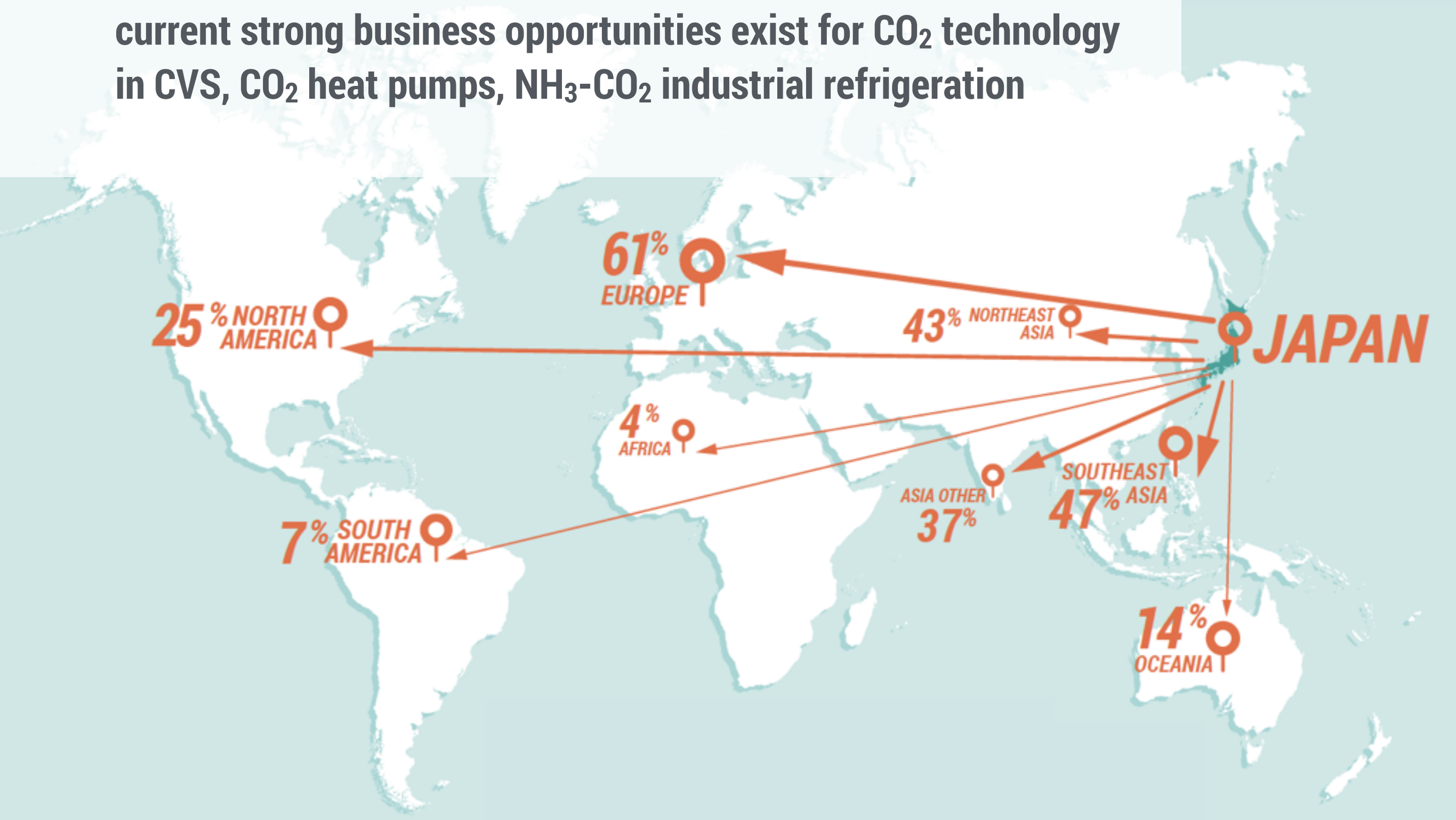
trend 3: japan's NR tech in the world

Europe, Asia & North America are the next markets for Japanese technology … in various application sectors

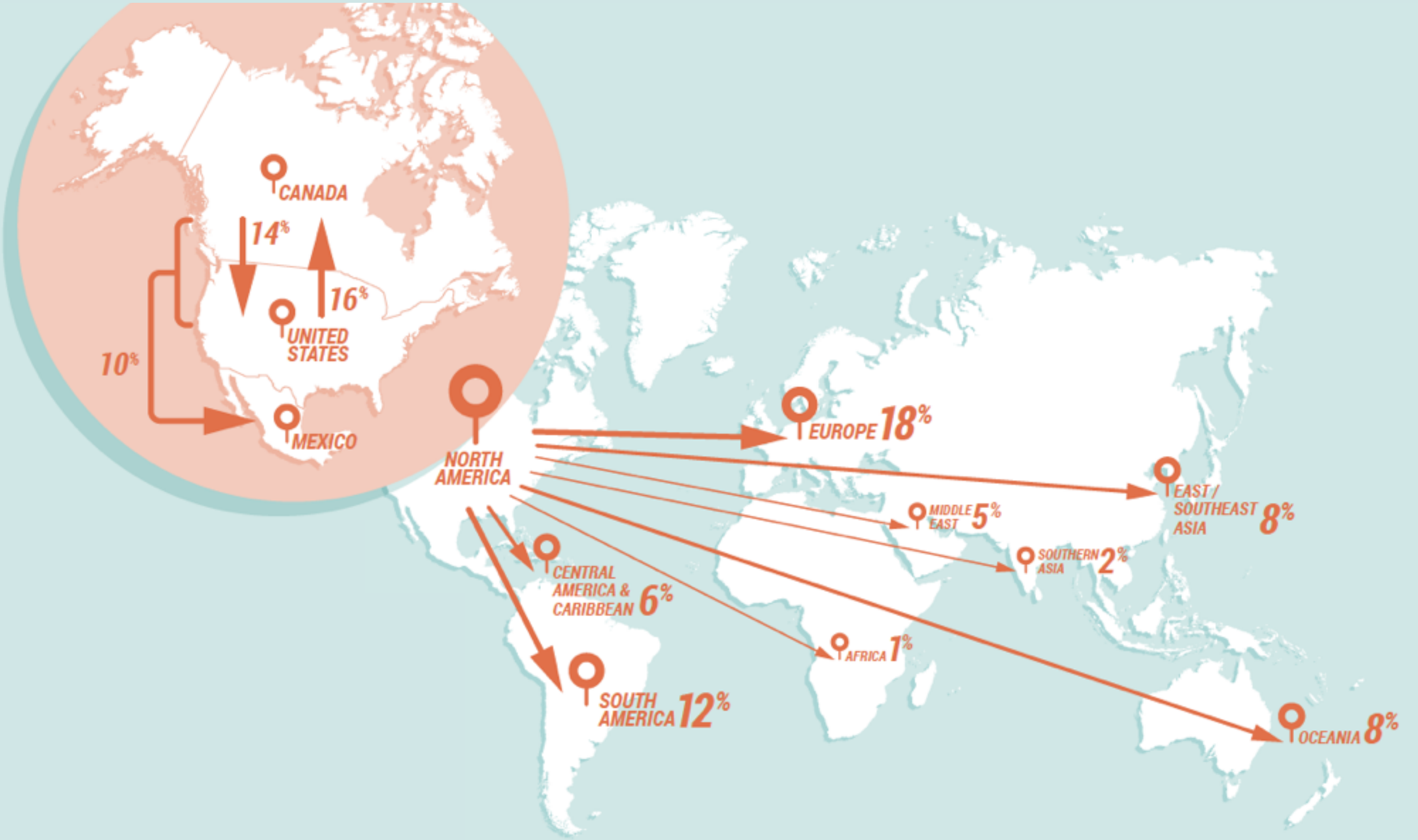


trend 3: japan's NR tech in the world

current strong business opportunities exist for CO_2 technology in CVS, CO_2 heat pumps, NH_3-CO_2 industrial refrigeration

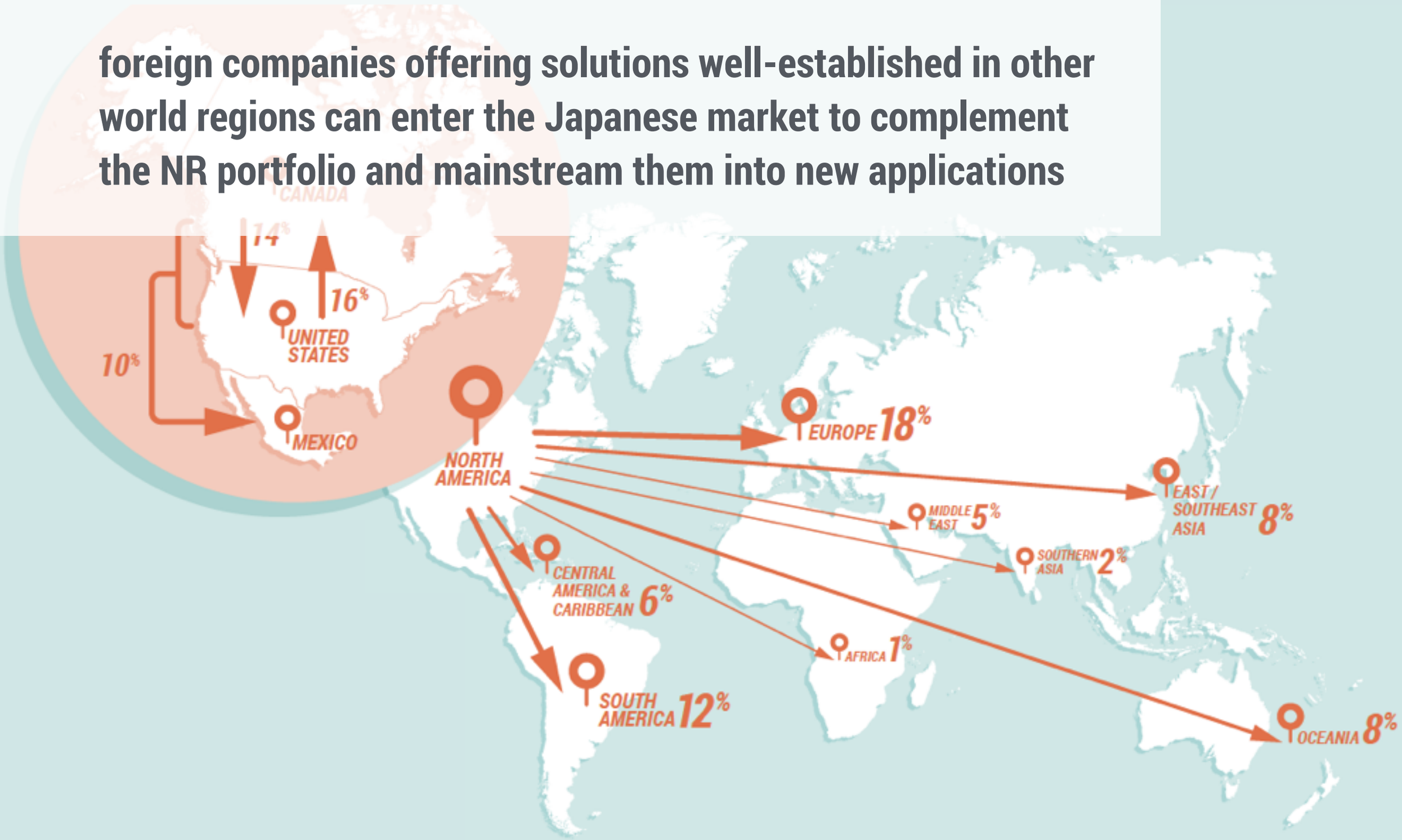


trend 4: a global NR market



trend 4: a global NR market

foreign companies offering solutions well-established in other world regions can enter the Japanese market to complement the NR portfolio and mainstream them into new applications



Industry Platforms:

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http://www.R744.com

http://www.ammonia21.com

http://www.R718.com

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