



natural refrigerants in china

preview into the "GUIDE China - State of the Industry"

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shecco



intelligence & research - advocacy - projects



china: an emerging market for NR solutions across all applications

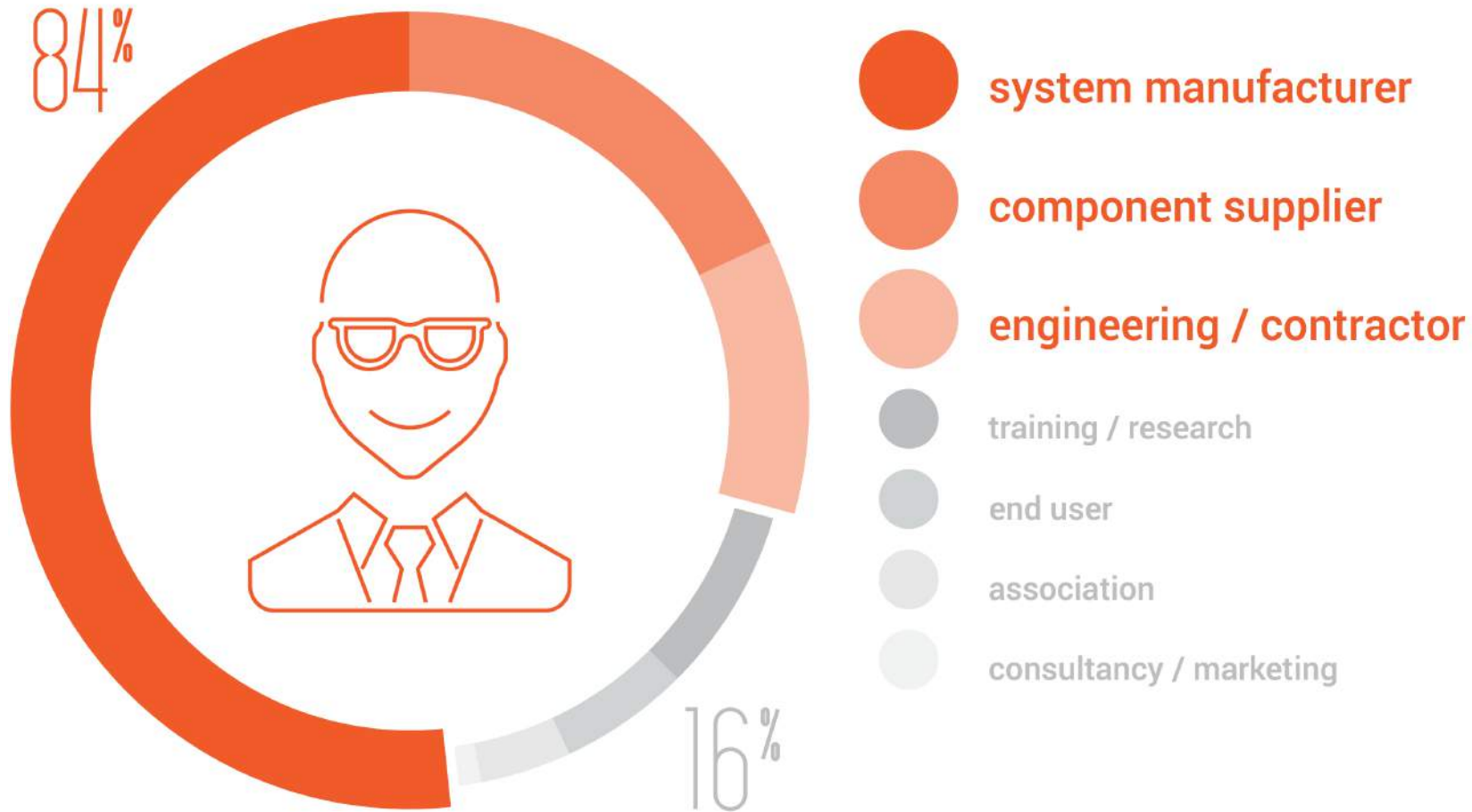
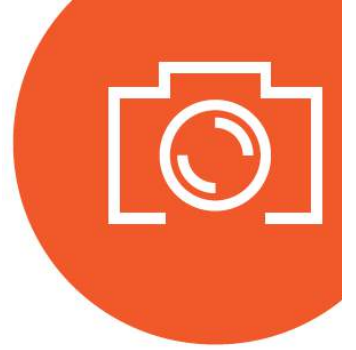


GUIDE China 2015



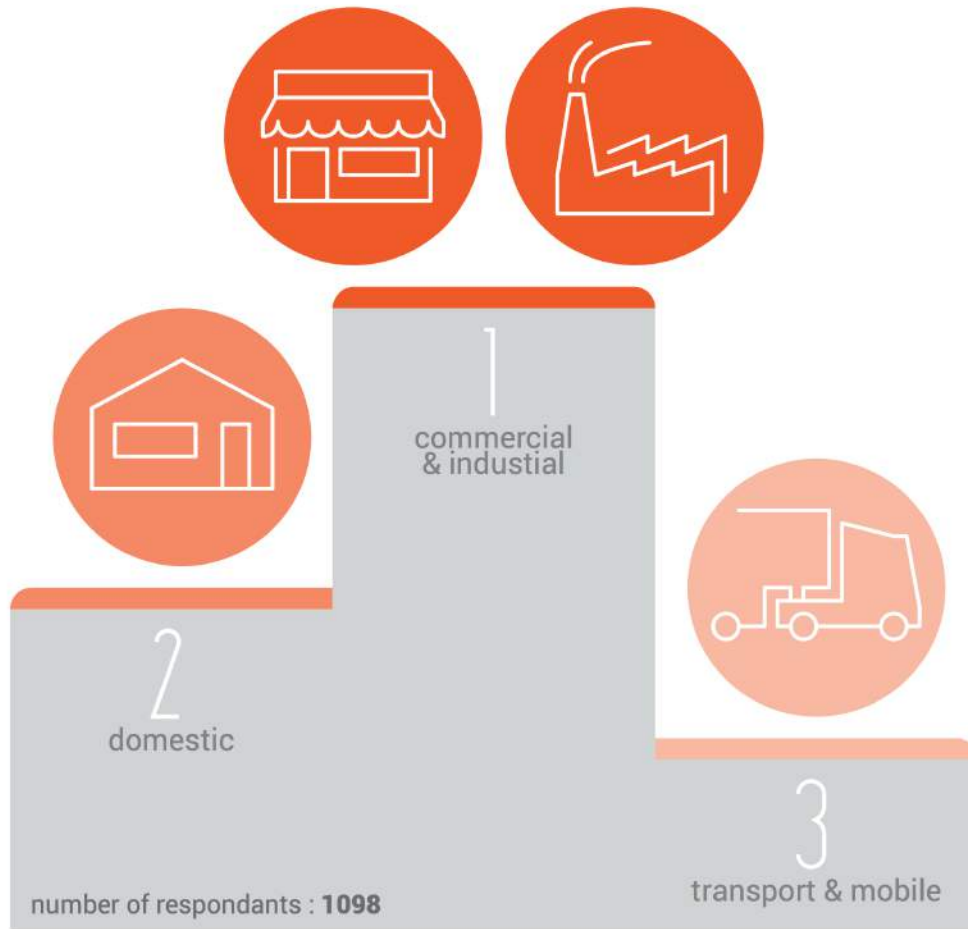
- in cooperation with Chinese Association of Refrigeration
- survey in Chinese and English = largest industry survey about NR so far
- close to 1,100 respondents
- overview of NR technology, market & policy trends
- eco-systems, case studies, market maps

GUIDE China: survey participants



= strong industry perspective

GUIDE China: survey participants



most represented
area of activity

least represented
area of activity

in heating, refrigeration and
air conditioning applications

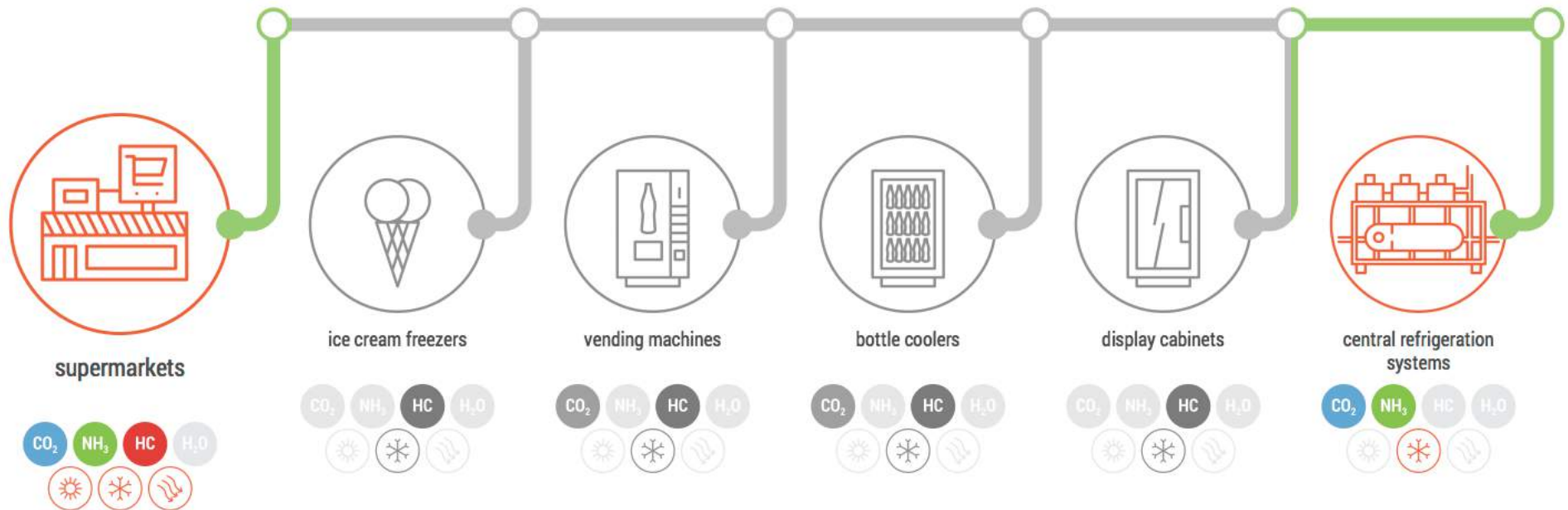
**= most active in
commercial & industrial
size applications**

GUIDE China: survey participants



= high representation of large market players

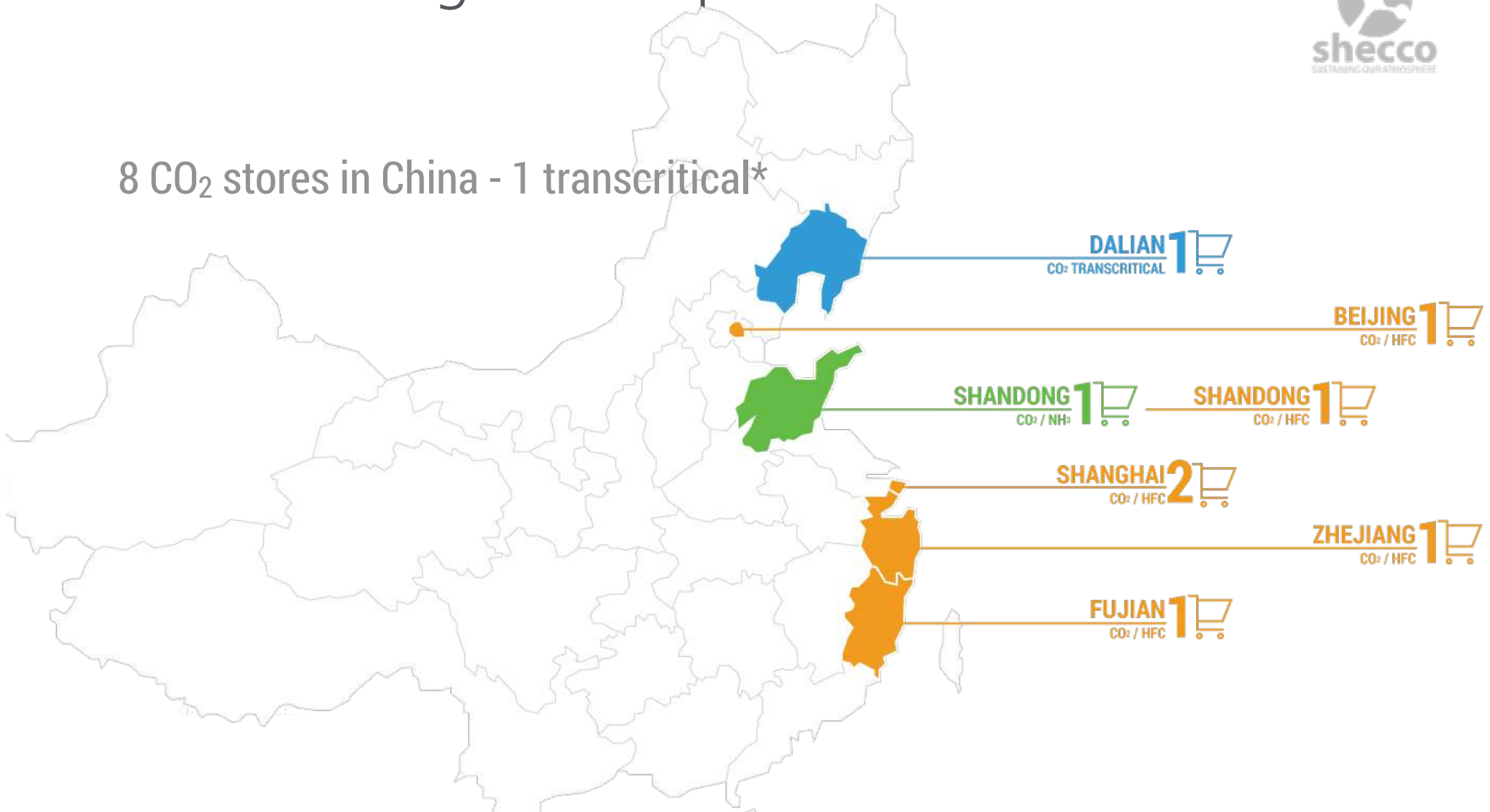
china: commercial refrigeration



natural refrigerant supermarkets



8 CO₂ stores in China - 1 transcritical*



NR uptake driven by global food retail brands (now: Tesco, Metro)

* source: shecco, status: March 2015

china: end-user interview



What are the key features in using natural refrigerants technology in China that differs from other countries?



“The aim is everywhere to minimize the environmental impact caused by our business. From a technical point of view the **availability of competent and skilled suppliers** has to be taken into account. Besides this China stretches across several **different climate zones**, which have to be considered in the selection and design of plant concepts.

**Holger Guss,
Senior Manager
Technical
Engineering**

How do you evaluate your progress in using natural refrigerants in China so far and what are your plans for the next 5 years?

We successfully opened our **first hybrid cooled store in November 2014**. For the coming new store openings and the planned remodeling under our global F-gas exit program **this concept should become our standard concept in China**. Furthermore we are **aiming to install the first transcritical CO₂ system in China in the coming years**. In addition Metro would like to **introduce R290 operated plug-in cabinets as we did already in plenty of other countries** we are operating in.

china: end-user interview



What is the return on investment for natural refrigerant technology compared to conventional technology?

The main motivation for us to use natural refrigerants in our systems is higher efficiency and sustainability. In comparison to most of the standard 'conventional' systems and according our experience **these advanced and carefully monitored refrigeration systems are more energy efficient and have lower life cycle costs.** This aspect has strengthened our **decision to implement natural refrigerant as well in China although this is not a state of the art technology yet.** With higher market implementation of natural refrigerants **we are expecting less additional costs and even a faster return of investment.**

china: commercial refrigeration - outlook 2020



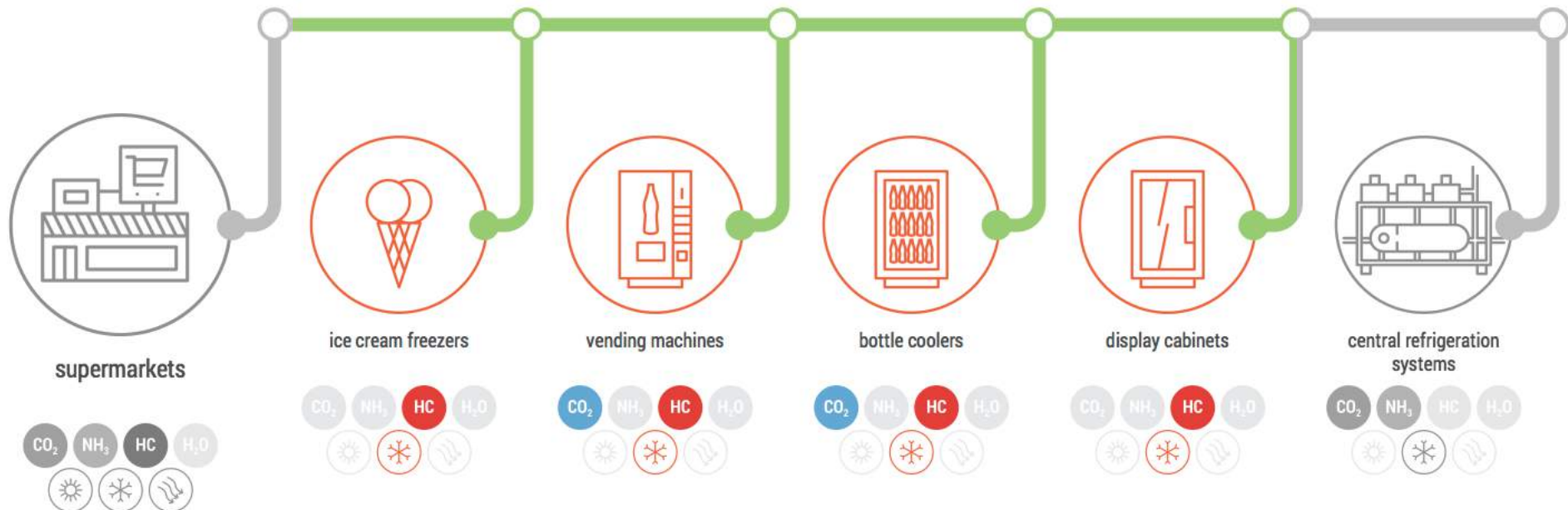
number of respondents : 536



...of the respondents expect the use of natural refrigerants in commercial refrigeration will...



china: light-commercial refrigeration



china: light-commercial applications



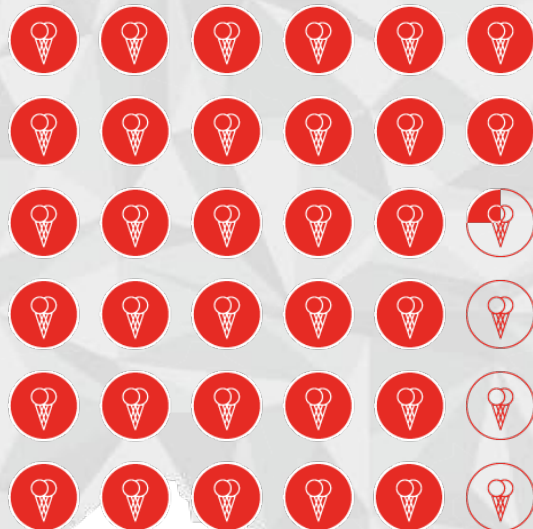
400,000

HC stand alone cabinets



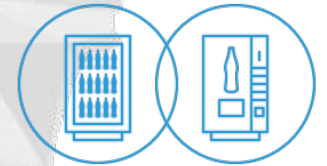
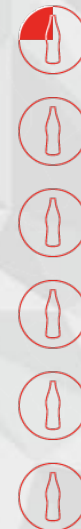
322,000

HC ice cream freezers



2,500

HC bottle coolers
& vending machines



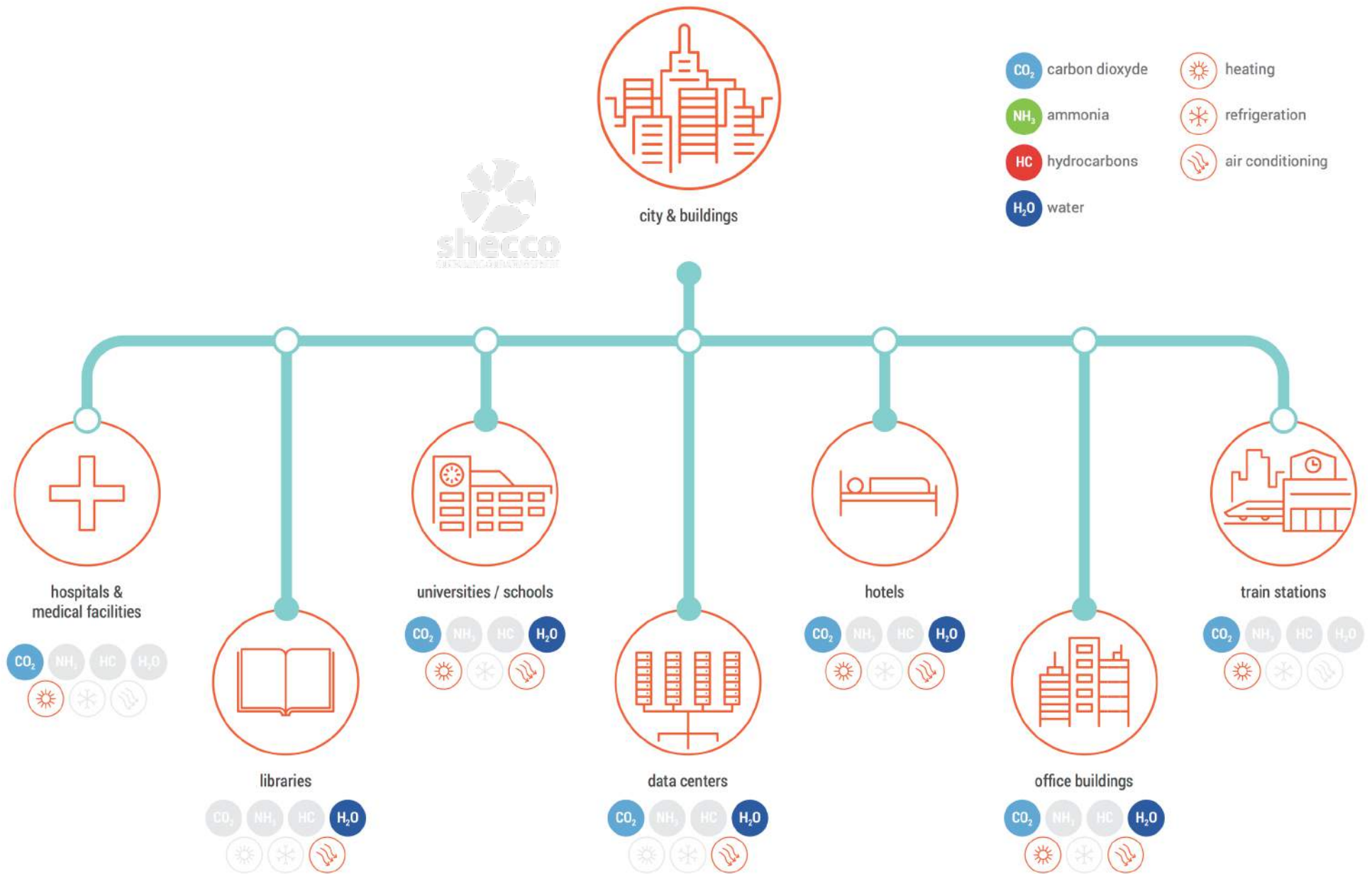
25,000

CO₂ bottle coolers
& vending machines

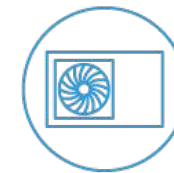
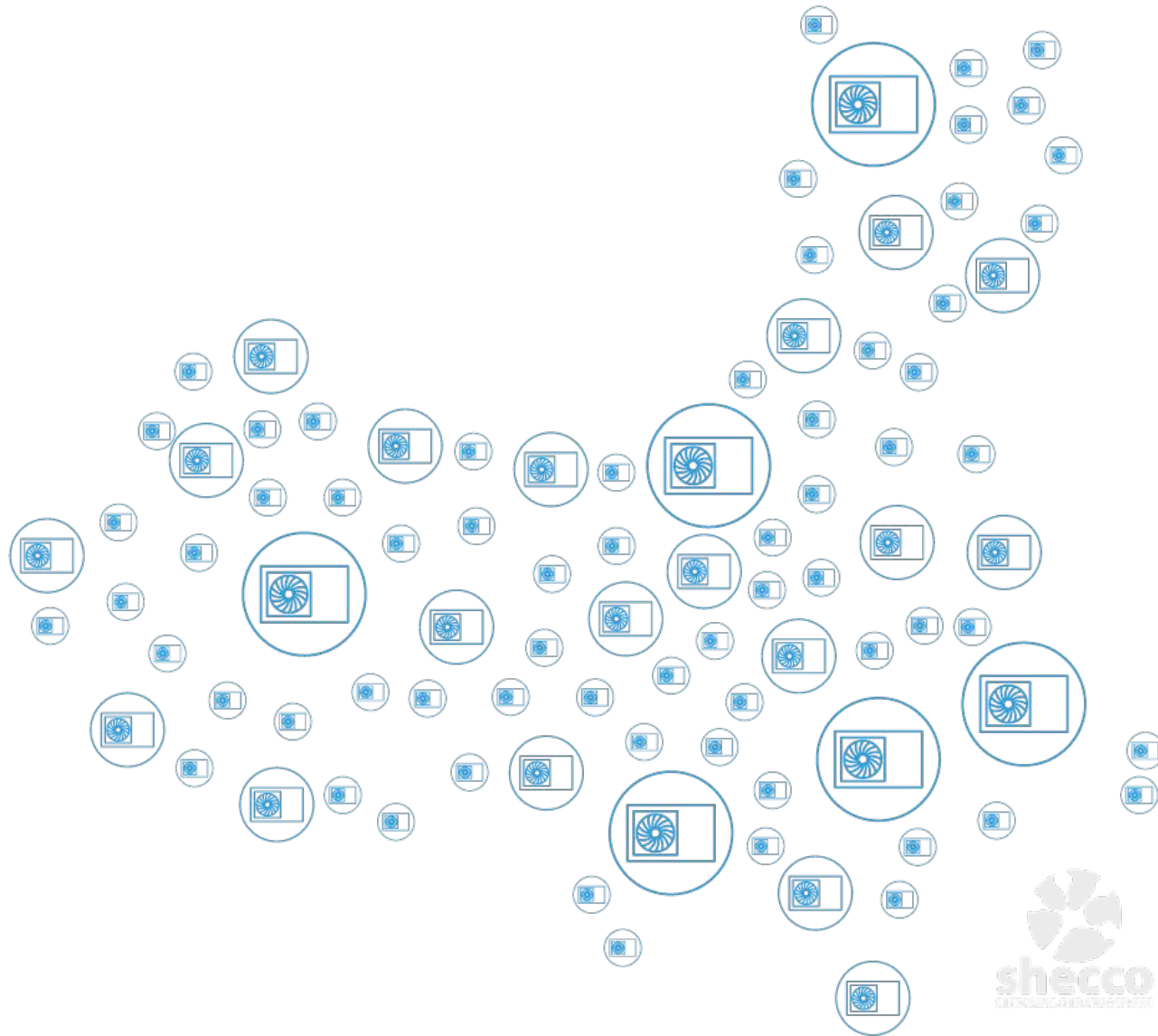


china: city & buildings

2015



china: heat pumps



160+

CO₂ transcritical
commercial heat pumps
(7 suppliers)



* data, combined from 7 suppliers

source: shecco, status: March 2015

china: heating - outlook 2020



number of respondents : 536



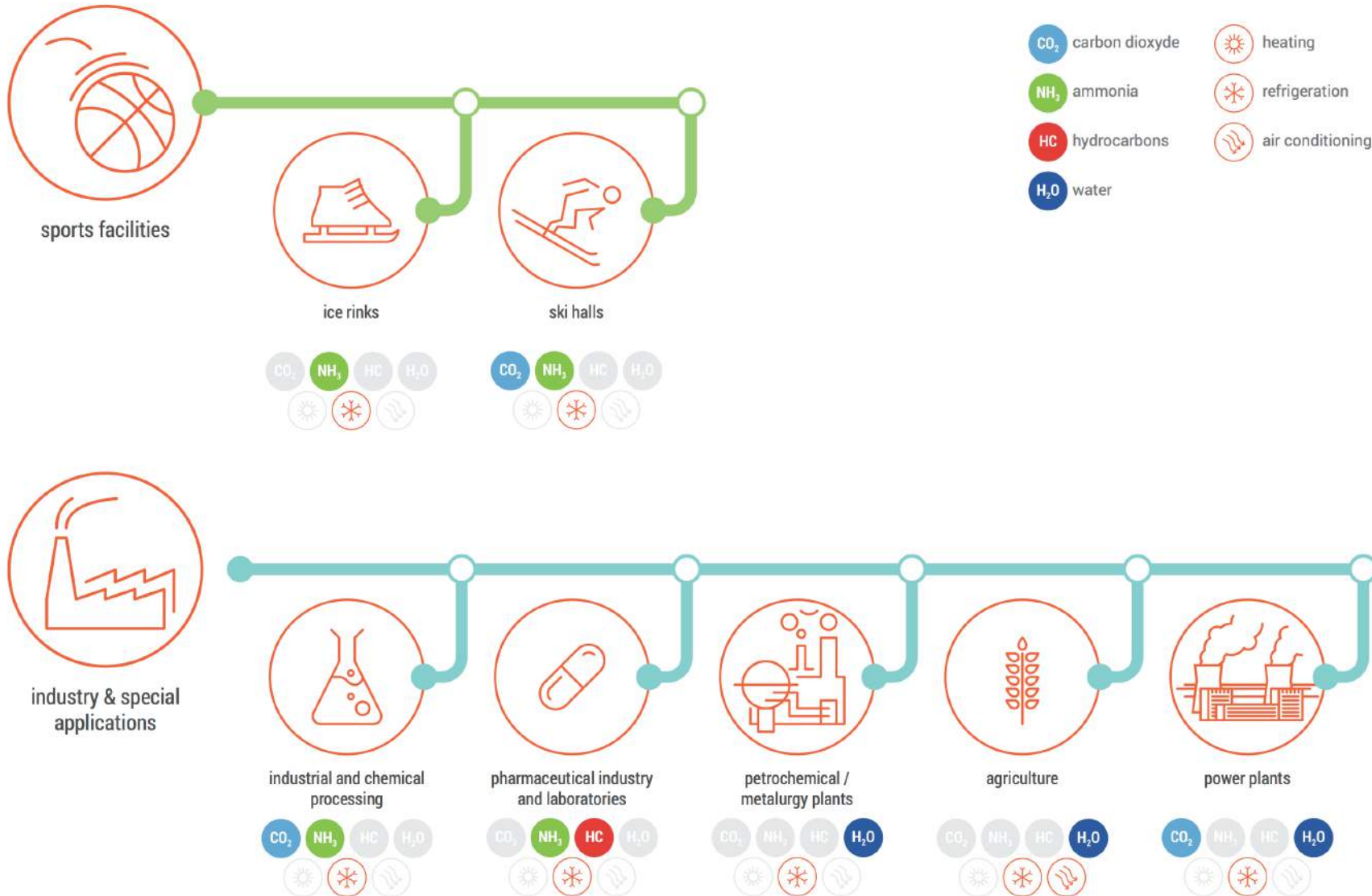
...of the respondents expect the use of natural refrigerants in heating will...

increase by 2020

remain the same by 2020

decrease by 2020

china: industrial refrigeration

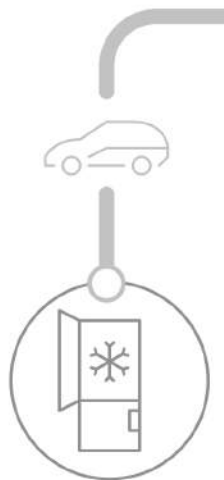


china: industrial refrigeration

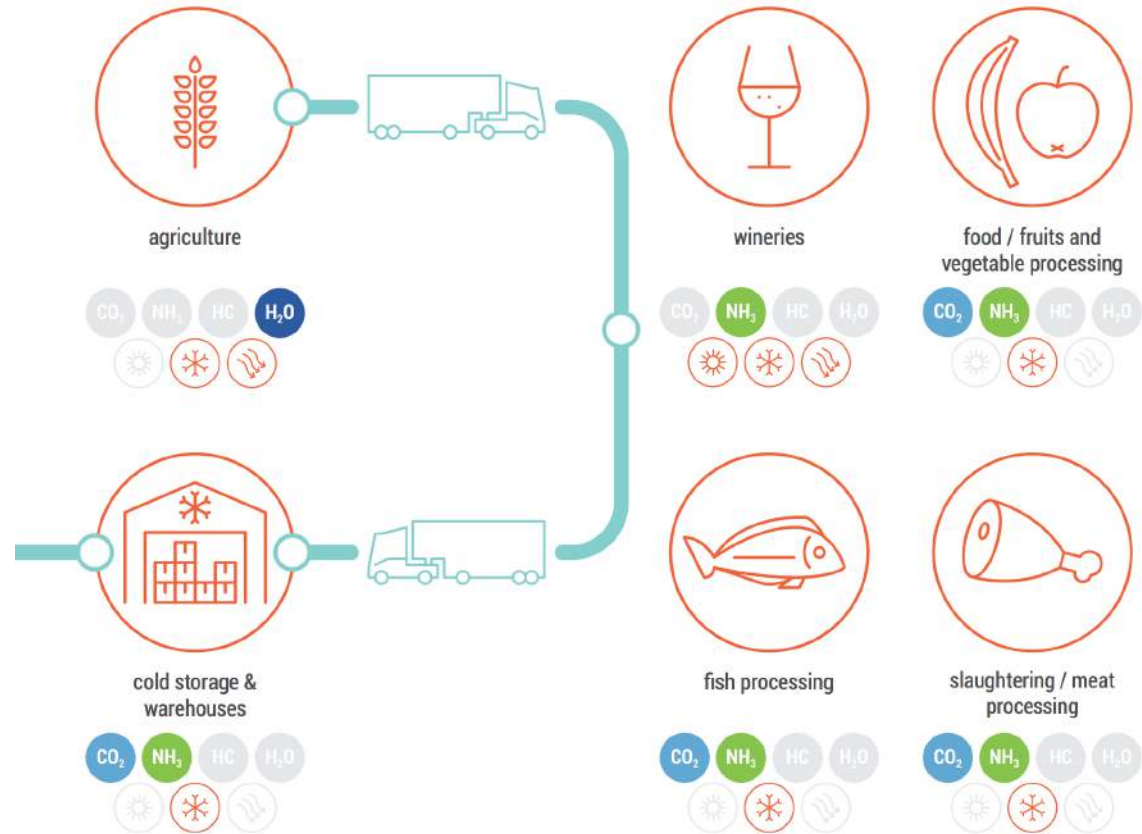


Currently more than 30,000 companies in China use ammonia as a refrigerant.

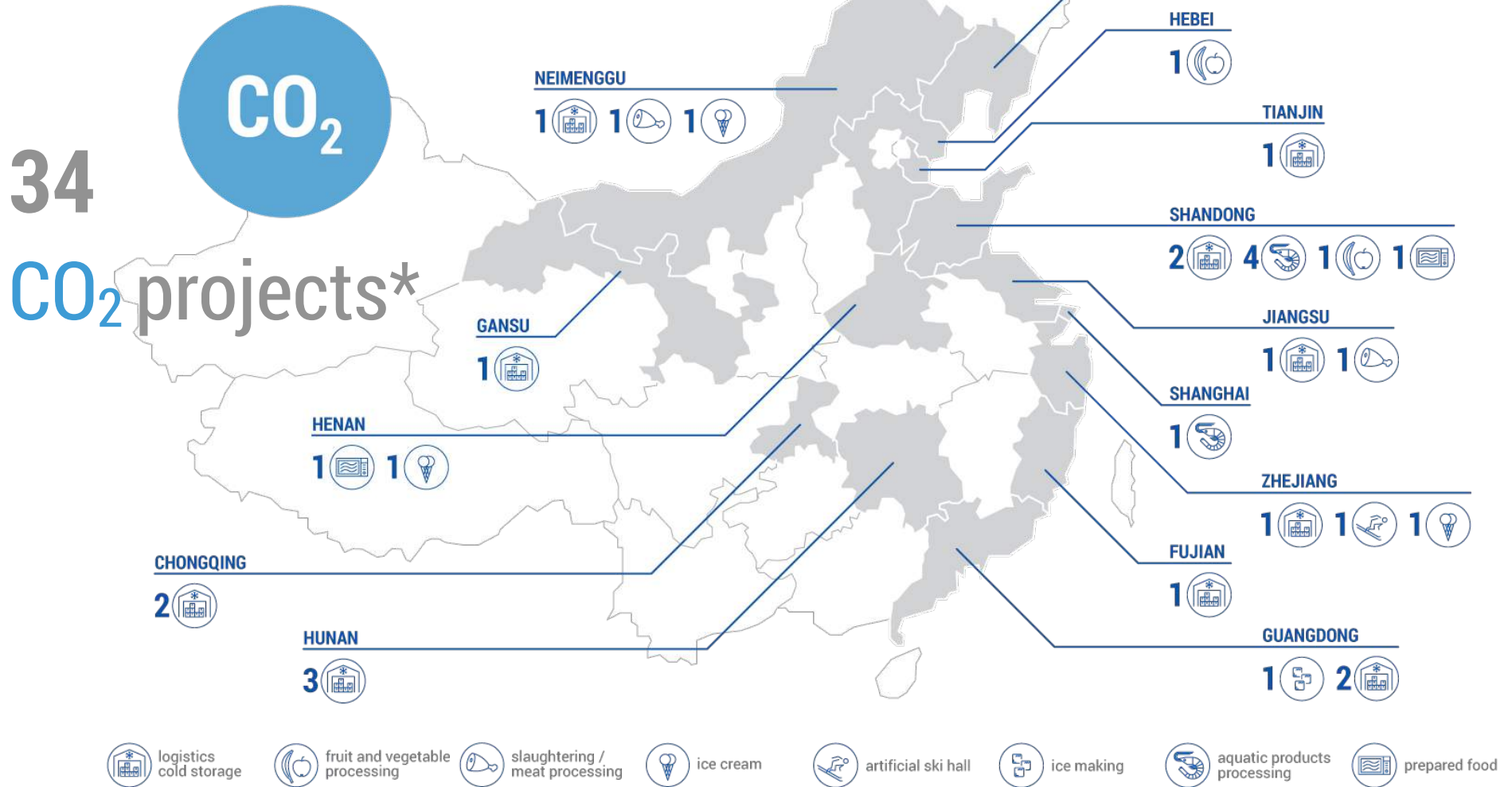
By 2017, China will likely surpass the capacity of the US cold chain, currently at 115 million m³ of space.



domestic refrigerator / freezer



china: industrial refrigeration

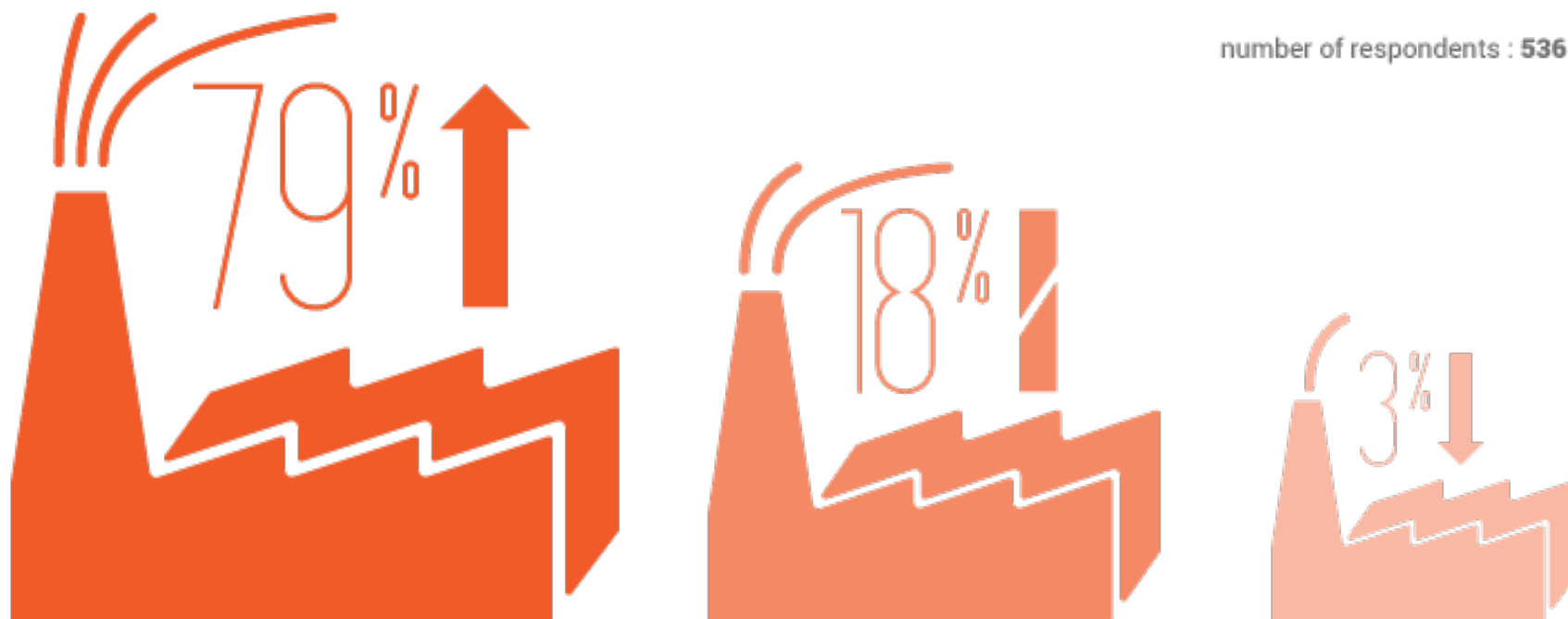


* includes 30 NH₃ / CO₂ both cascade and secondary systems + 4 CO₂/HFC or CO₂/HCFC plants

china: industrial refrigeration - outlook 2020



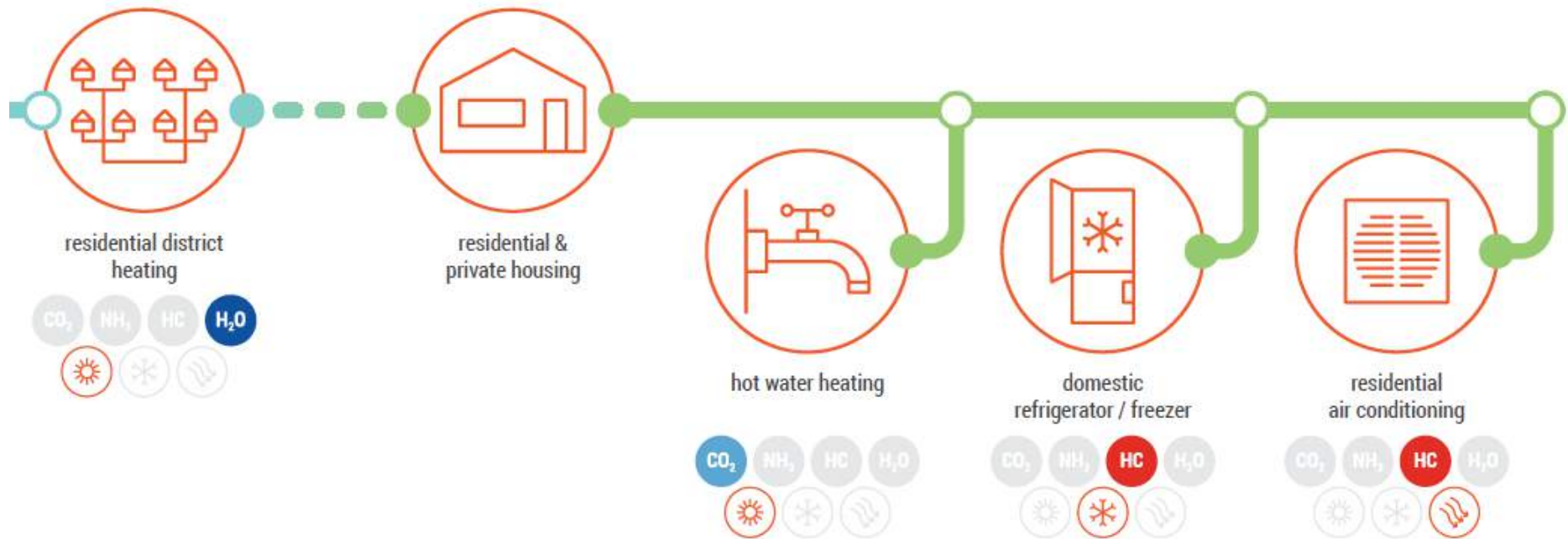
number of respondents : 536



...of respondents expect the use of natural refrigerants in industrial refrigeration to...



china: domestic refrigeration / heating / AC



china: room air conditioning



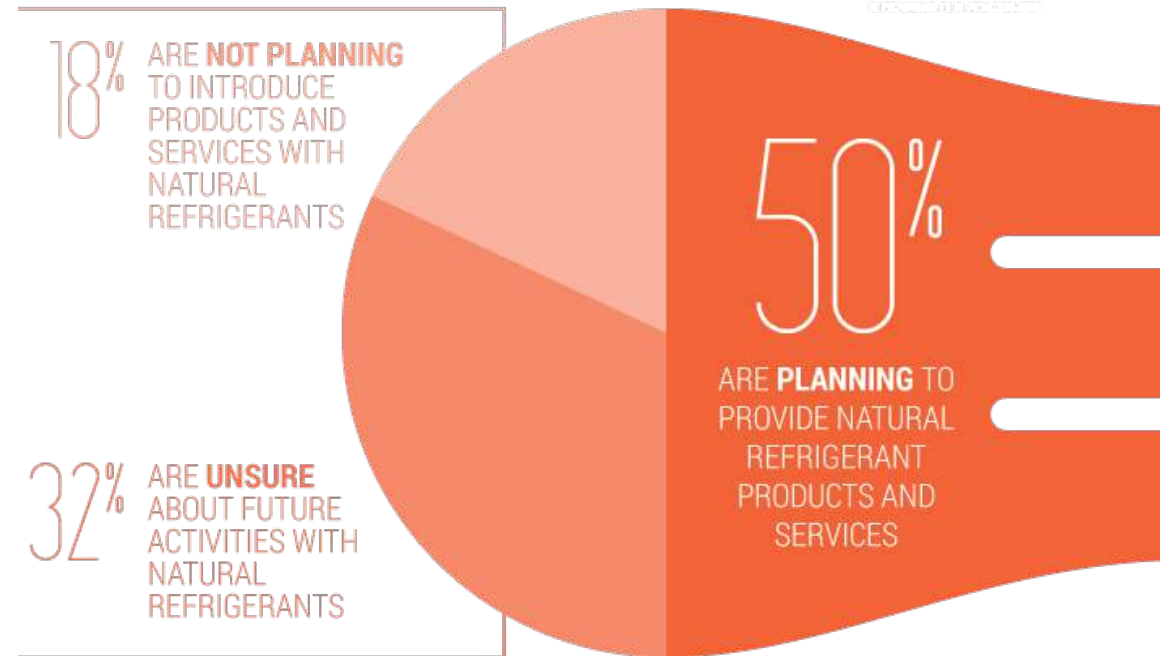
100,000 units annual production capacity for R290 RAC



potential: 4.5 million R290 units after full conversion has taken place

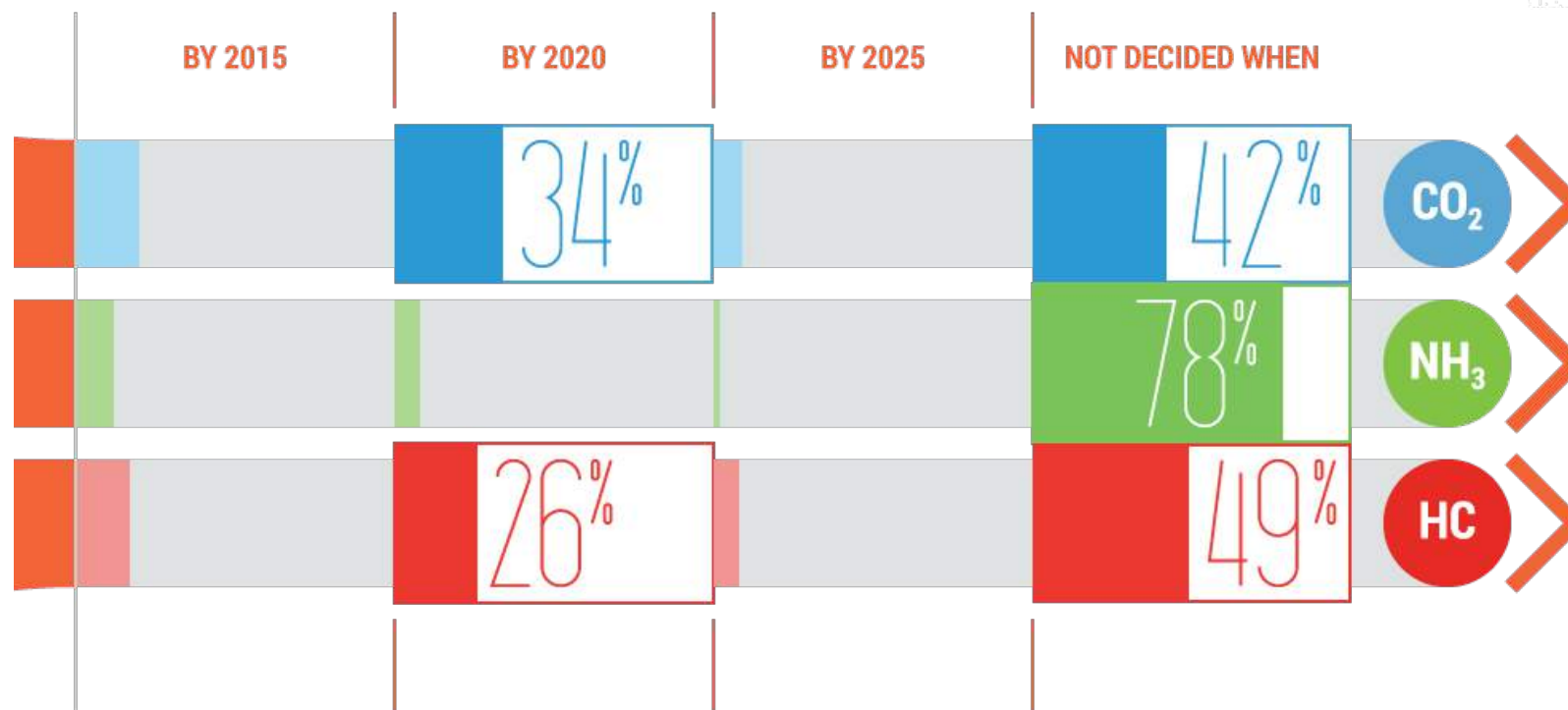


plans to use NR ...



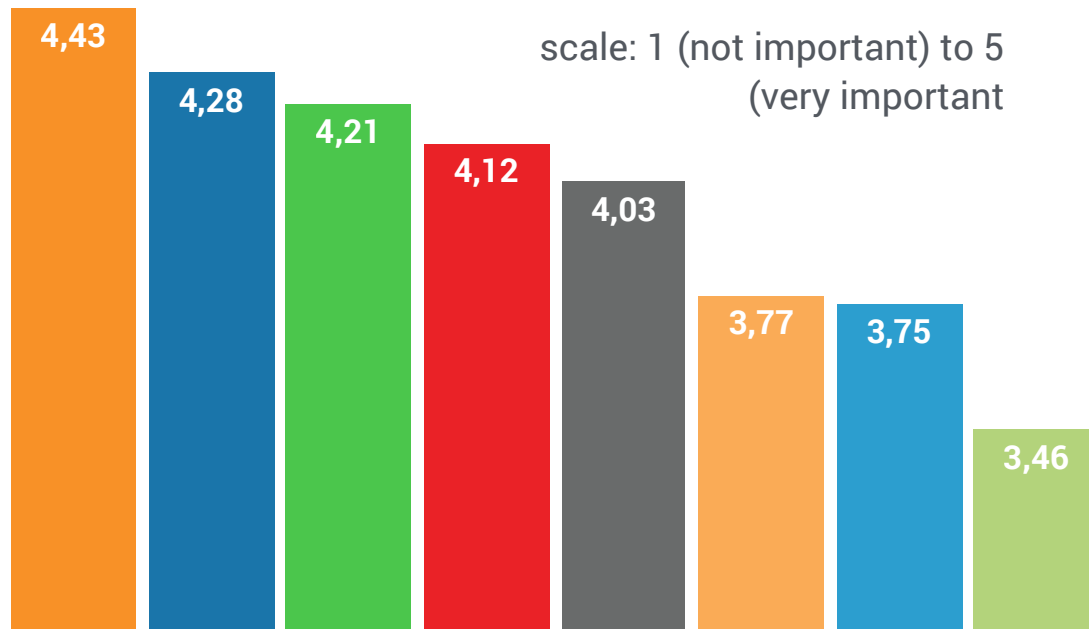
- half of all respondents currently NOT using NR (50.1%) say that they will provide products or services with natural refrigerants in the future
- another 32% is not sure yet = large untapped potential for more communication about NR technology and its business case

... and by when exactly



- in 2020, there will be a big shift towards CO₂ when 34% want to start using it
- another 26% plan to use hydrocarbons in five years from now
- a large part of the Chinese industry is undecided when exactly, especially for NH₃

drivers for NR industry in china



- National regulation restricting HFC use
- Global agreement on HFC phase-down
- Review or introduction of standards to enable NR use
- Financial incentives for manufacturers / end users
- Higher availability of components for NR systems
- Higher awareness of NR technology, knowledge sharing
- Higher availability of training & safety programs for HVAC&R industry
- Voluntary industry / end user commitment to phase out HFCs / HCFCs

- government policy will be key in NR market growth: restricting HFC use is the most important driver = “very important”
- a global agreement on HFC phase-down, better standards for NR, financial incentives = “important”
- no strong belief in voluntary action by HVAC&R industry or end-users

china: policy trends



- new **Environmental Protection Law** for 2015, revised version after 25 years = stricter monitoring and enforcement system
- national **government strategy for natural refrigerants** (HCFC phase-out plan) in RAC - mostly for HC
- expected for 2015: a new **government strategy on CO₂ and NH₃ in the cold storage industry**
- new **Energy Efficiency Label** (Jan 2015); applied to air-source heat pump water heaters
- **Top Runner label** (Jan 2015) for domestic appliances incl. room A/C; 2) high energy consumption industries and 3) public buildings



summary

- **between natural refrigerants** there is **choice** and **competition**
- different countries / world regions have put a **priority on different natural substances in different applications** that are now a mainstream solution or on their way to become one:
 - Europe: NH₃ industrial refrigeration + HC domestic / light-commercial refrigeration + CO₂ commercial refrigeration, with high potential for other applications
 - North America: NH₃ industrial refrigeration + emerging large potential for HC domestic / light-commercial refrigeration + emerging CO₂ commercial refrigeration
 - Japan: CO₂ heat pumps & commercial refrigeration; CO₂ industrial refrigeration + emerging potential for HCs
 - India: NH₃ industrial refrigeration + HC room air conditioning
 - China: has the potential to become a world leader for NR in different applications quickly: NH₃ industrial refrigeration, HC domestic / light commercial refrigeration; with high potential in CO₂ heat pumps (+ supermarkets) + HC air conditioning

shecco - useful links



Industry Platforms:

<http://www.hydrocarbons21.com>

<http://www.R744.com>

<http://www.ammonia21.com>

<http://www.R718.com>

ATMOsphere conferences, side-events & network meetings:

<http://www.ATMO.org>

shecco Publications, incl. GUIDEs

<http://publications.shecco.com>

Accelerate Magazine

<http://accelerate.shecco.com>

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