Innovation Experience 2019

Inspiring your digital transformation in HVAC and Refrigeration

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Cooling Policy Landscape and Leadership Opportunities

HFC-free Commercial Refrigeration

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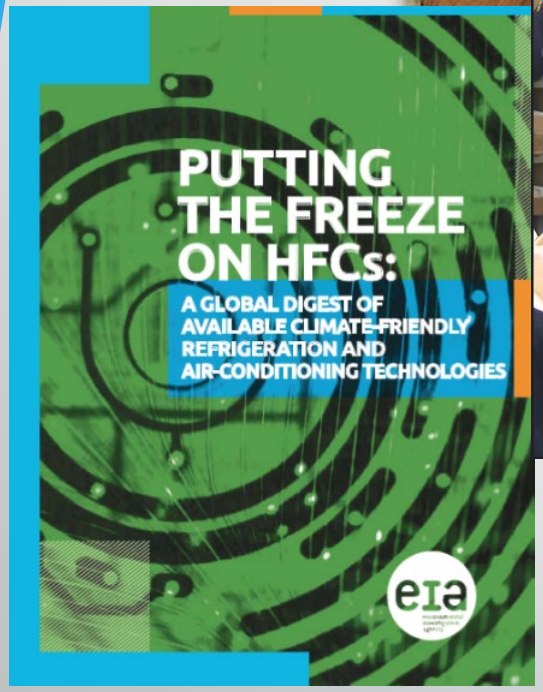
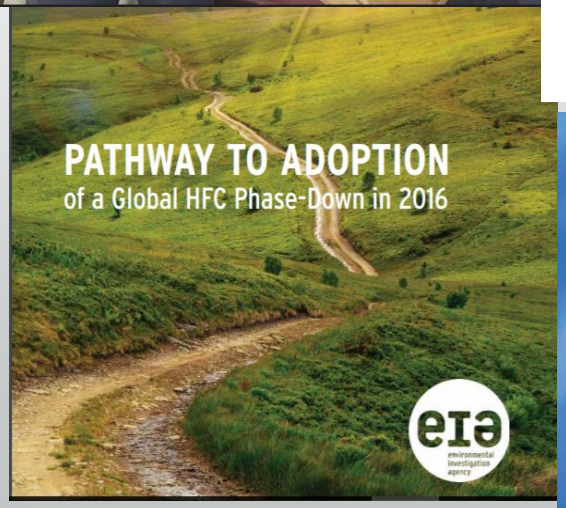
Environmental Investigation Agency



Bringing the U.S. Fridge Market into the 21st Century

Low-GWP Technology in Domestic Refrigeration



- About EIA

Context

https://twitter.com/i/status/1176511841465491456

Avipsa Mahapatra @avipsa_m · 9m

Kudos for moving up climate commitment & timeline! Proud to be talking to leaders in #cooling industry @*Eliwell by SchneiderElectric Innovation Event* this week on how #coolingwithoutwarming critical to a sustainable future #ClimateWeek2019

> **Jean-Pascal Tricoire** @jptricoire · 15h
>
> We stepped up our commitment to be carbon neutral by 2025, setting a net-zero emissions goal by 2030, and a net-zero supply chain by 2050. I, alongside our partners, customers and companies all over the world are reducing our carbon footprint. #ClimateWeek schneider-electric.us/en/about-us/pr...

earch products, documents & more

ODUCTS SOLUTIONS SERVICES SUPP

dmap for the Carbon Neutral World

ions and an Inclusive Growth Transition Plan to
Behind.

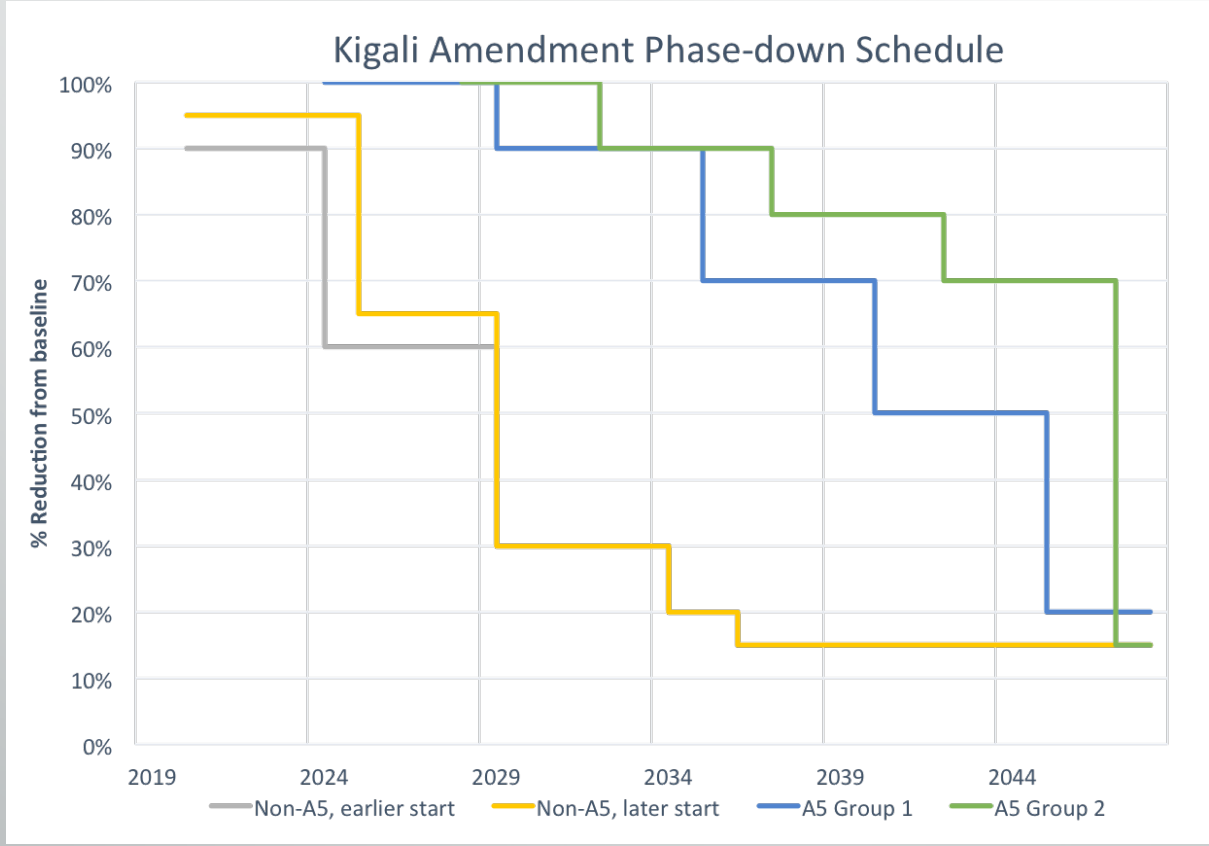
ber23, 2019 – Schneider Electric announced today at drastically stepping up its commitment to carbon 1) accelerating its 2030 goal of carbon neutrality in its to 2025, (2) setting net-zero operational emissions by get and (3) net-zero supply chain by 2050. These to the Intergovernmental Panel on Climate Change's nperature increase at 1.5°C. Schneider Electric is also uce emissions, offering support through products and nline and find efficiencies within their own operations.

gest threat to the health and well-being of our society. our carbon emissions and halt the rise in temperature." says Jean-Pascal Tricoire, Chairman & CEO at Schneider Electric. "At Schneider Electric, our commitment to carbon neutrality is weaved into our business decisions and governance, but we need to do more and faster. Not only are we stepping up our carbon

Global Regulatory Landscape: State of Play

- Globally: Kigali Amendment enters into force
- EU F Gas Regs
- US: Federal regulatory uncertainty
- California, other states and sub-national actors on global stage
- Standards
- Takeaways and new opportunities

Kigali Amendment Enters Into Force



- 81 countries have ratified
- Includes: Japan, EU, UK, Australia, Canada, and Mexico
- Entry into force: January 1, 2019
- Most developed countries: 10% consumption reduction by 2019, 40% by 2024
- US ratification still a ?

US Situation

Federal

- The SNAP Program: pertinent rules (20 and 21) reversed or vacated by court
- Section 608 Refrigerant Management Program: Proposal to rescind leak rate, leak repair requirement for HFCs as 'substitutes'

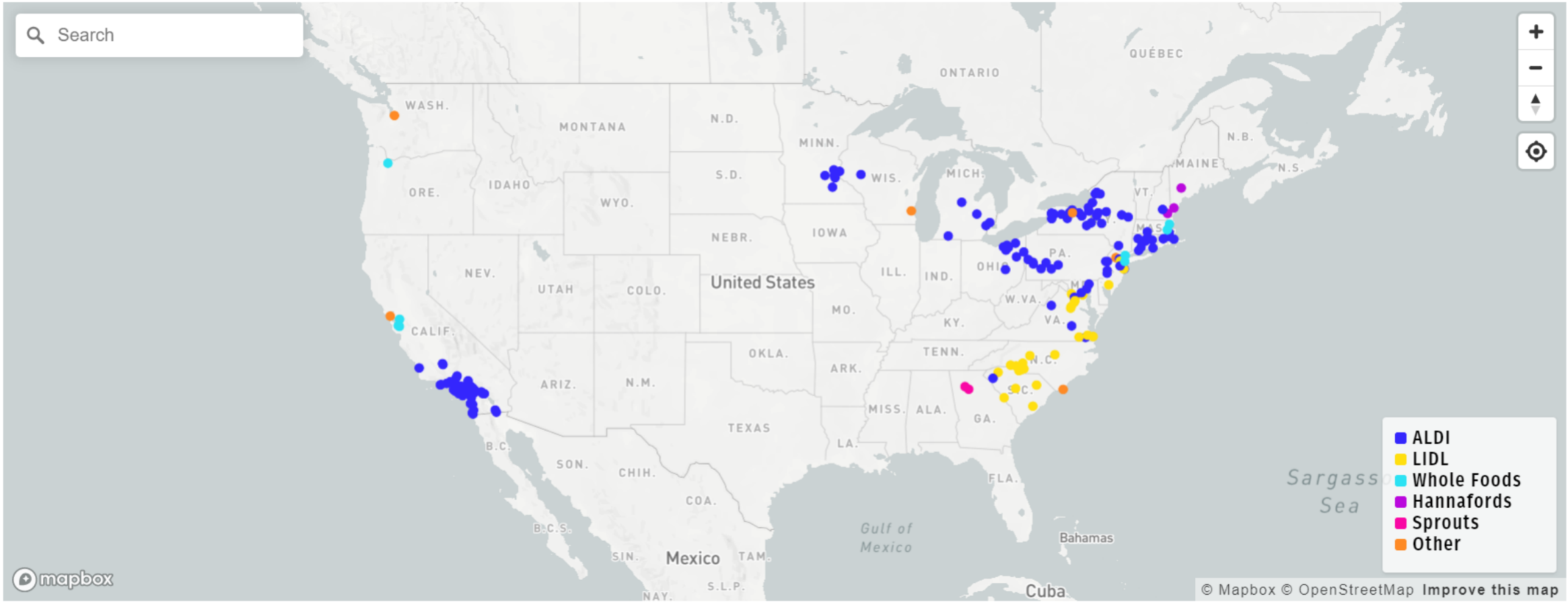
Sub-national

- **US Climate Alliance (>50% of US pop and 57% of economic activity):**
  - Rapidly growing membership: now 23 states
  - Focused initiative on SLCPs
  - HFCs as a bipartisan initiative at state level

climatefriendlysupermarkets.org/map

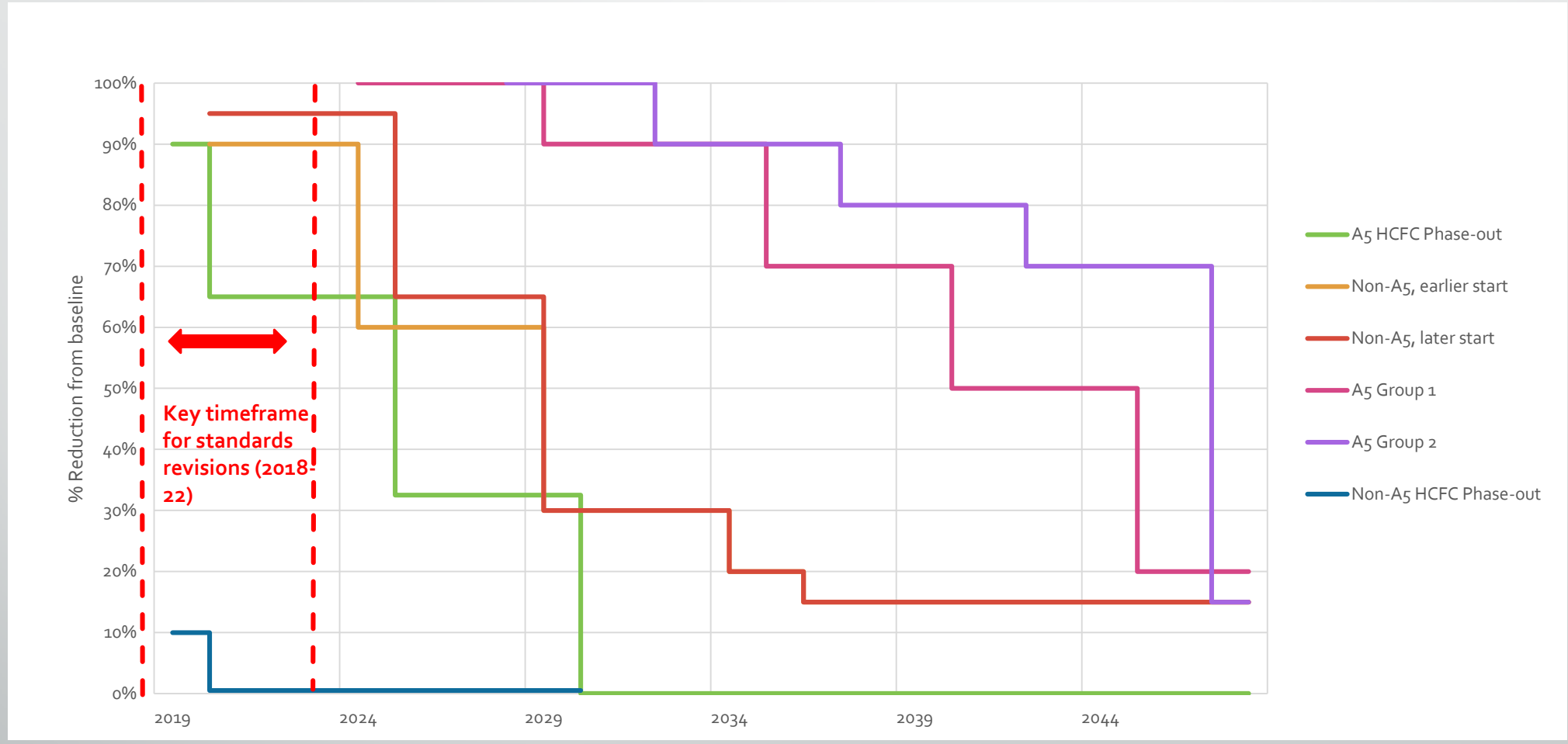
< HOME

Is there a climate-friendly supermarket near you?



STORES ON THE MAP MAINLY USE <150 GWP REFRIGERANTS AND/OR ARE EPA GREENCHILL PLATINUM CERTIFIED.

Time for Action on Standards




Timely and coordinated structures / dedicated working groups
Consider new safety measures and technologies to mitigate risks
Transparency + Broad stakeholder participation
Smarter Standards
Re-examine outdated data and assumptions
Sufficient resources for technical experts
Comprehensive synchronous examination of ALL alternatives

Leadership Opportunities

1. Energy Efficiency
2. Addressing Leaks
3. Recycling, Recovery and Destruction

IPCC: Faster F-gas reductions than Kigali Amendment to be consistent with 1.5°C pathways

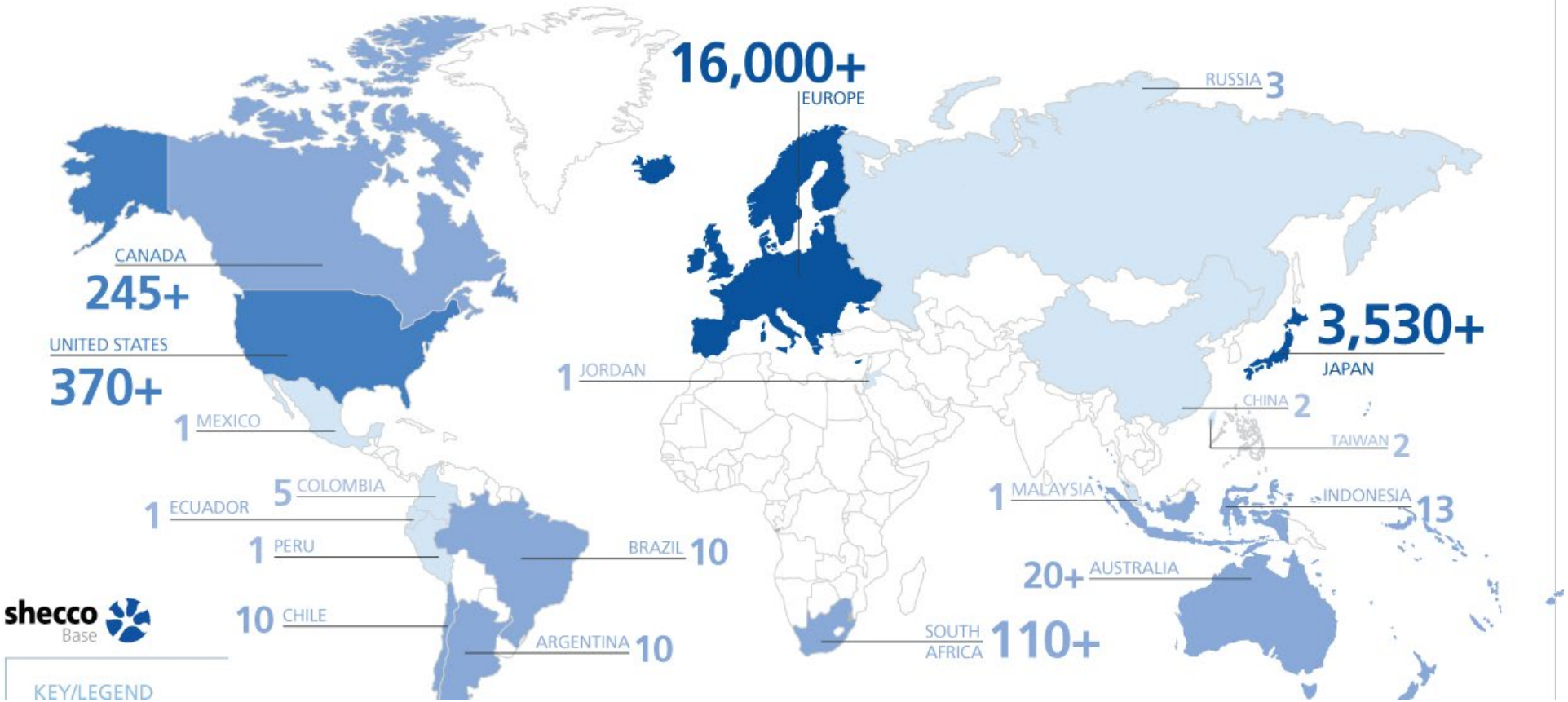
Basic Facts

- **23% of food loss** due to lack of cold chain
- Cold chain in developing countries is **growing fast** (25% annual growth in China)
- —> **HFC consumption** and **energy use** could have severe negative impact
- Refrigeration accounts for up to **60%** of total energy use in supermarkets

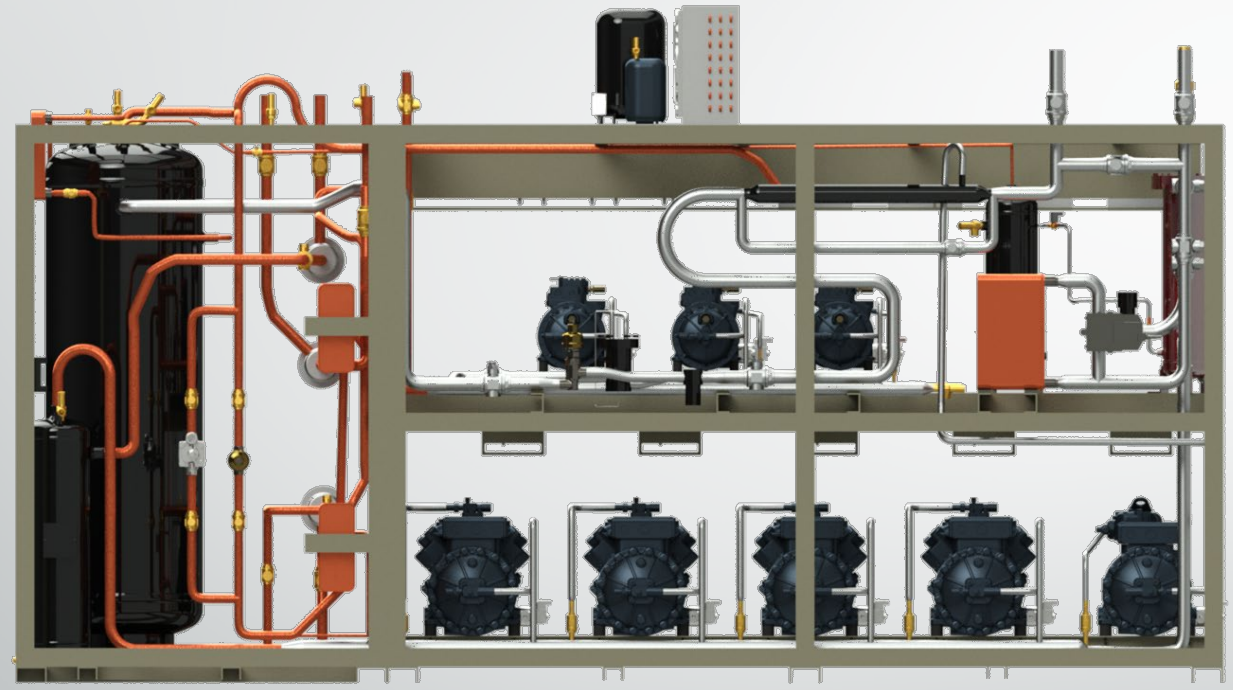
Energy efficient HFC-free refrigeration needs to be introduced rapidly to avoid locking in damaging technologies in the developing world

CO_2 transcritical stores in the world

October 2018



Centralized Systems- CO_2 Transcritical



- **With today's technology** it possible to reach better energy performance of CO_2 TC compared to HFCs in climates with **temperatures up to 45°C**
- A growing trend towards **full integration of heating and air-conditioning** with refrigeration systems and utilising the free heat and free cooling to cover the needs otherwise fulfilled by additional energy systems
- The payback period for the heat recovery can be **less than five months**

CO_2 Condensing Units

- Small and medium-sized stores up to 30kW
- Japan - 3,500+ stores
- Europe - growing number of manufacturers
- 27% better energy efficiency compared to HFCs, reported by an end user
- Higher initial cost is offset by lower running cost

HC Plug-In Units

- Over 2.5 million HC plug-in refrigerated showcases in supermarkets globally- highly energy efficienct
- Lower initial cost compared to centralized systems + easy maintenance
- HC waterloop technology-1,900+ stores globally
- At least 16% lower running costs compared to HFCs
- Review of standards would unlock the potential of HCs

Role of Component Design

- Individual components & systems design can considerably improve energy efficiency:
  - heat exchanges
  - compressors
  - expansion valves
  - controls, etc.
- Glass doors (lids) on cabinets can reduce refrigeration capacity of a supermarket by up to 40%
- Heat recovery to reduce gas or oil heating bills

Existing Systems

- regular service & maintenance by trained technicians
- optimize compressor set points and expansion valve calibration
- monitor refrigerant charge & repair leakages
- correct loading of cabinets
- add doors & night covers on cabinets
- use LED lights
- inspect and clean heat exchangers, etc.
- Install **computational tools**
  - Energy consumption and cost
  - Leakage rates
  - GHG emissions
  - Lifecycle costs

New System

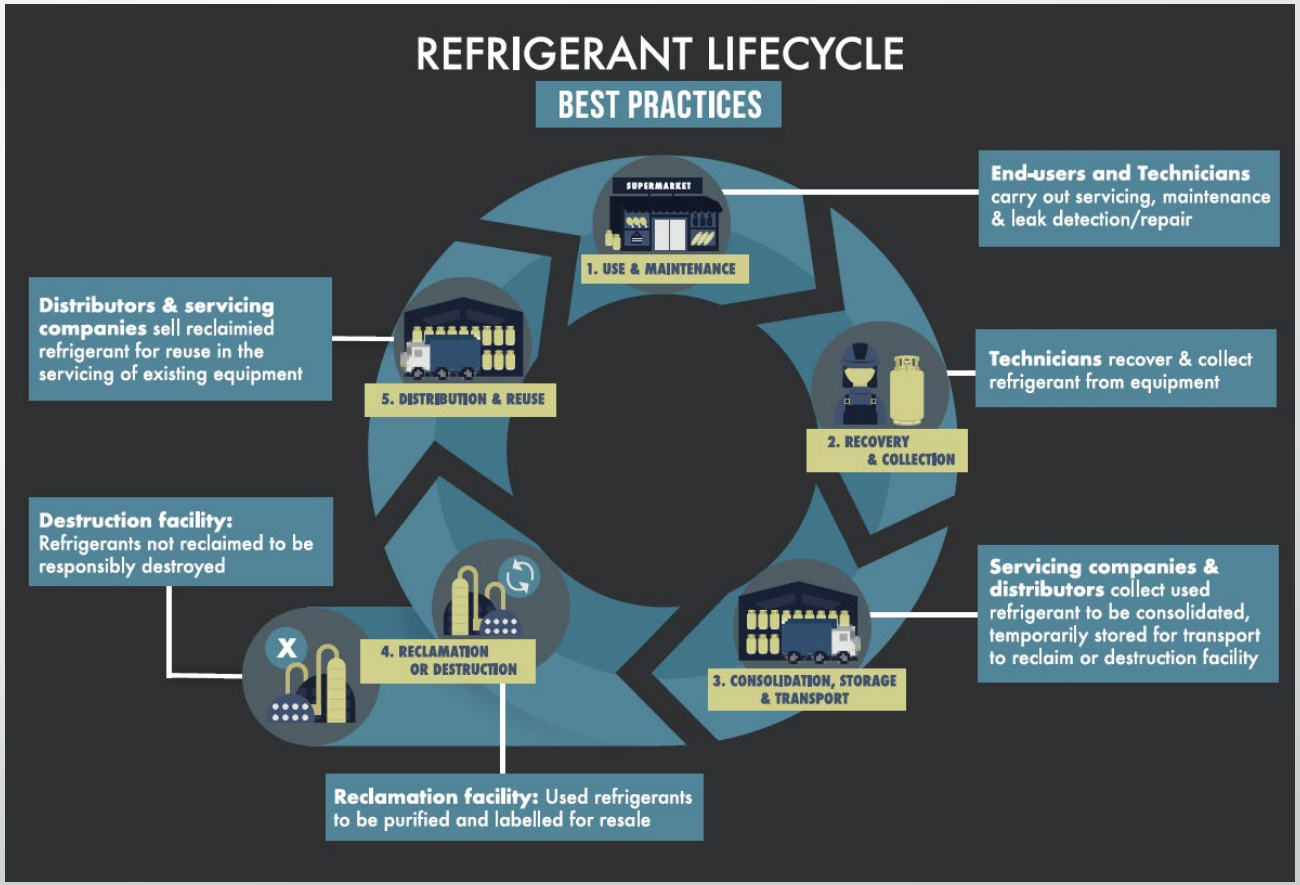
- Practice best energy efficiency as covered in existing systems
- Install only the most efficient **HFC-free technologies** available with state-of-the-art components and controls
- Think holistically
- Take advantage of heat recovery and energy storage where possible

Moving Forward

Establish and publish ambitious and comprehensive estate-wide targets and action plans to significantly improve efficiency of supermarket refrigeration alongside the phase-down of HFCs

Recycling, Recovery and Destruction

- Scale of mitigation opportunity similar to HFC phase-down
- Project Drawdown: #1 mitigation solution is refrigerant banks
- Globally: Up to 96.5 billion MTCO2e (2020-50)



Read the report: "Search Reuse and Destroy"
https://eia-global.org/reports/20190214-search-reuse-destroy

Leaks

Average supermarket refrigeration system leaks 25% of its total refrigerant charge annually

- or 875 pounds =annual emissions of nearly 400 passenger cars

Refrigerant Management Practices

- Periodic maintenance and leak inspections
- Installation of automatic leak detection equipment,
- Prompt repair of leaks
- Perform a more comprehensive retrofit or replacement of aging equipment with repeated leak events above a certain threshold.

Recordkeeping and data collection

- Calculation and reporting on leak rates provides a useful source of information on refrigerant inventories, leaks, and amounts disposed.

Conclusion

Global HFC phase-down is in motion

- EU, China moving fast
- Global conversation
- In United States,
  - sub-national actors are filling gap left by federal policy uncertainty
  - Corporations moving or under pressure

Barriers

- Modernizing safety standards remains key barrier to market penetration of natural refrigerants
- More complexity and need for training but also simplification of the solutions
- Costs and training remain barriers

Opportunities for leadership by a wide range of actors

- Retailers and other end users need to demand future proof (HFC-free) solutions
- Industry needs to invest in the future - send experts to the standards discussions and relevant Montreal Protocol meetings
- Governments need to offer training and financial support measures
- Massive mitigation opportunity in refrigerant management and end-of-life

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Available for download on eia-global.org

California: SNAP Prohibitions in place

- ARB SNAP Rulemaking
- California Cooling Act (SB 1013)
- End Uses covered:
  - Aerosols
  - Foams
  - Retail Food Refrigeration (various equipment types)
  - Residential Refrigeration
  - Cold Storage Warehouses
  - Chillers

Retail Food Refrigeration

End-Use	Substitutes	Effective Date
Supermarket Systems (Retrofit)	R-404A, R-407B, R-421B, R-422A, R-422C, R-422D, R-428A, R-434A, R-507A	Unacceptable as of January 1, 2019.
Supermarket Systems (New)	HFC-227ea, R-404A, R-407B, R-421B, R-422A, R-422C, R-422D, R-428A, R-434A, R-507A	Unacceptable as of January 1, 2019.
Remote Condensing Units (Retrofit)	R-404A, R-407B, R-421B, R-422A, R-422C, R-422D, R-428A, R-434A, R-507A	Unacceptable as of January 1, 2019.
Remote Condensing Units (New)	HFC-227ea, R-404A, R-407B, R-421B, R-422A, R-422C, R-422D, R-428A, R-434A, R-507A	Unacceptable as of January 1, 2019.

Full list of prohibitions at: https://ww2.arb.ca.gov/resources/fact-sheets/hydrofluorocarbon-hfc-prohibitions-california