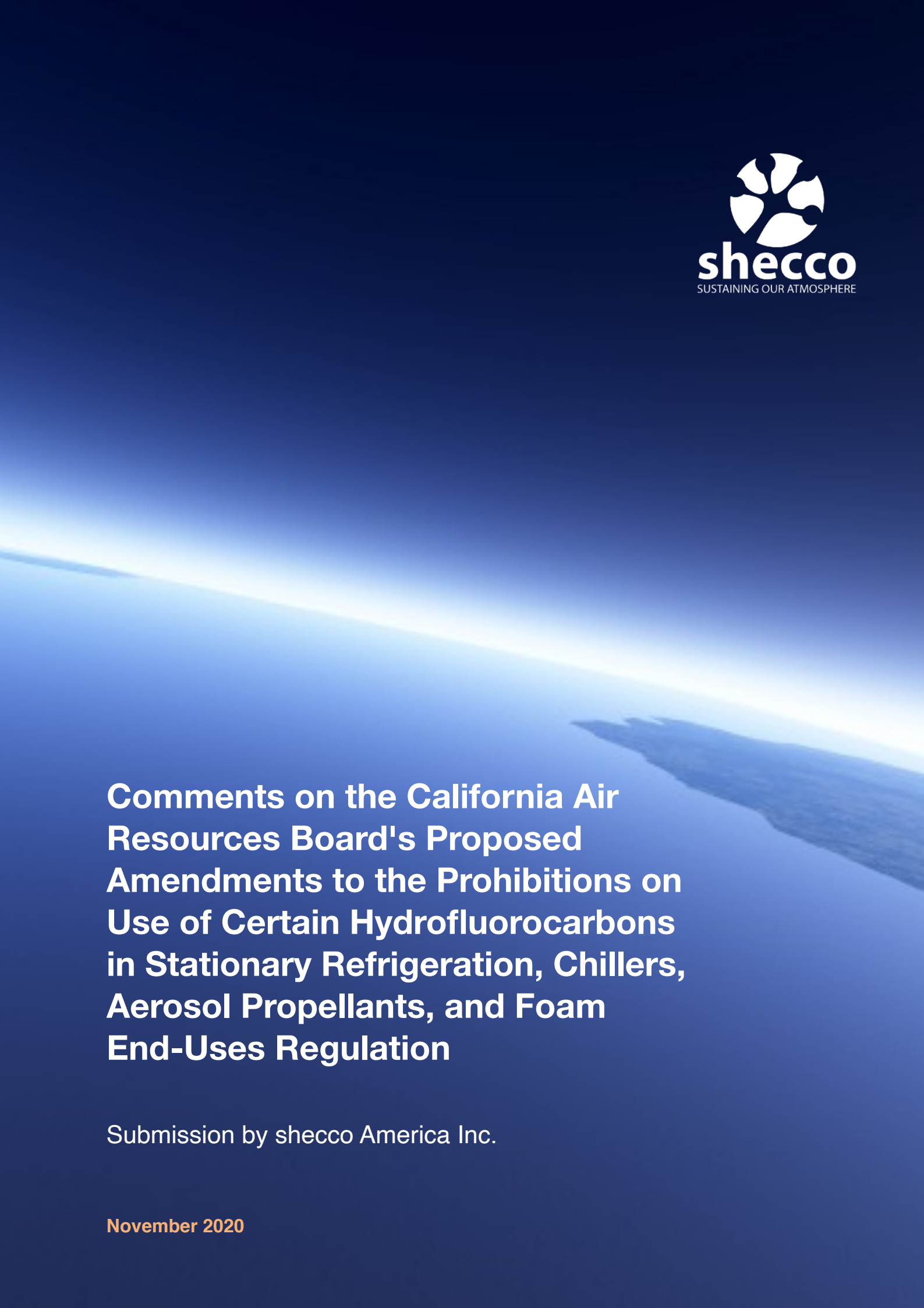


Comments on the California Air Resources Board's Proposed Amendments to the Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Chillers, Aerosol Propellants, and Foam End-Uses Regulation

Submission by shecco America Inc.

November 2020

shecco America Inc. welcomes this opportunity to comment on the Proposed Amendments to California's HFC Regulation. We are a market accelerator for climate friendly refrigeration and air conditioning technologies with a global presence. Together with our network of industry-leading partners, we are global experts in alternatives to HFCs with nearly 20 years active in the Heating, Ventilation, Air Conditioning and Refrigeration (HVAC&R) industry. More specifically, we concentrate on accelerating the uptake of natural-refrigerant-based technologies such as carbon dioxide, ammonia, hydrocarbons, air, and water.

We believe in setting ambitious targets for the elimination of HFCs in the HVAC&R market, which can be supported by proven, commercially available, U.S.-manufactured natural-refrigerant-based technology already on the market today. However, we believe incentives and subsidies are necessary to support the transition to more climate-neutral, low-Global Warming Potential (GWP) solutions.

Natural-refrigerant-based air-conditioning and refrigeration equipment has been deployed in the U.S. for many years - in particular ammonia-based systems, and increasingly CO_2 and hydrocarbon solutions as well. These systems and associated components are predominantly manufactured locally in the U.S., employing thousands of American citizens with huge potential to scale up as policy and incentives drives the market towards more environmentally sustainable, natural HVAC&R solutions.

It is encouraging to see that the U.S. manufacturers of natural-refrigerant-based products are keeping up with global trends and technology - often even setting the bar for the rest of the world. Market research conducted by shecco in 2019/2020 indicates there are more than 650 stores in the U.S. already using CO_2 transcritical technology, as well as over 530 low-charge ammonia installations in mostly industrial facilities. This is the most cutting-edge technology on the market today and the total number of natural-refrigerant-based systems on the continent, is in the 1,000s.

There is great potential for this booming sector to stimulate growth in the U.S. economy. A strong legislative framework that favors HFC-free equipment, together with incentives and subsidies to support HFC-alternative solutions, would allow American companies to also export their products and know-how internationally to be global industry leaders in this field.

On the Amendments

In our experience, HFC bans for placing on the market new HVAC&R equipment is the most effective measure to deliver emission reductions and meet climate targets. Sectoral bans give clarity to industry to move away from HFCs within a clear timeline – rewarding the innovators, whilst also allowing sufficient time for those that are lagging behind to change their technology focus. We believe that climate policy, and resulting HFC bans, should be as ambitious as possible to accelerate the transition to climate-friendly alternatives.

Please see below our comments on the specific amendments proposed:

> "***New refrigeration systems containing more than 50 pounds of refrigerant and used in newly constructed and fully remodeled facilities will be required to contain refrigerants with a global warming potential (GWP) less than 150, effective January 1, 2022. This includes the following end-uses: retail food refrigeration, industrial process refrigeration (IPR) (except chillers), cold storage, and ice rinks.***"

Position Summary

1. We support the 2022 timeline.
2. This ban aligns with the HFC phase down and avoids the use of climate-damaging intermediary solutions.
3. Natural-refrigerant technology is already widely used across the U.S. and can support this sector.

- We support the 2022 timeline because the industry has already developed a variety of market-ready, commercially available HFC-free technologies that have proven to be energy efficient and cost effective in the U.S. and beyond - there are hundreds of examples of successful installations in the U.S across the HVAC&R sector (some which we will showcase in this comment).
- Such a ban would also be very well aligned with the Montreal Protocol HFC phase-down schedule, giving the industry clear direction to adopt very low-GWP, HFC-alternative technologies such as natural refrigerants and avoid intermediary solutions that might cause long-term climate damage.

Industrial Refrigeration Market Data

Traditionally dominated by ammonia and HFCs, the use of CO_2 transcritical systems has increased significantly in industrial refrigeration. In the U.S today, 7% of all transcritical CO_2 systems are for industrial sites (see Figure 1).

Key drivers for uptake are mainly the increased safety CO_2 offers, as well as higher energy efficiency, easier servicing, better return on investment for the end user, and the cost reduction of technology thanks to the growing competition and demand.

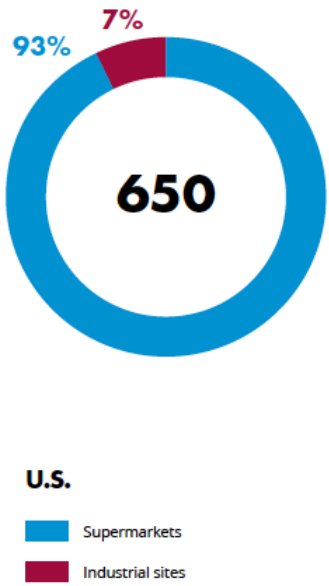
Low-charge ammonia has also been gaining momentum in the U.S., with an estimated 530 installations (Figure 2).

Hydrocarbons are also available and used for specific industrial applications. For instance, a cold storage warehouse for post-harvest flower processing and export in Colombia is using hydrocarbon R290 with the support of the United Nations Ozone Unit.[1]

The growing competition between natural refrigerants will likely push innovation to increase performance, and ultimately reduce costs.

American companies are embracing natural refrigerants for industrial refrigeration and realizing great emission and energy savings:

Figure 1



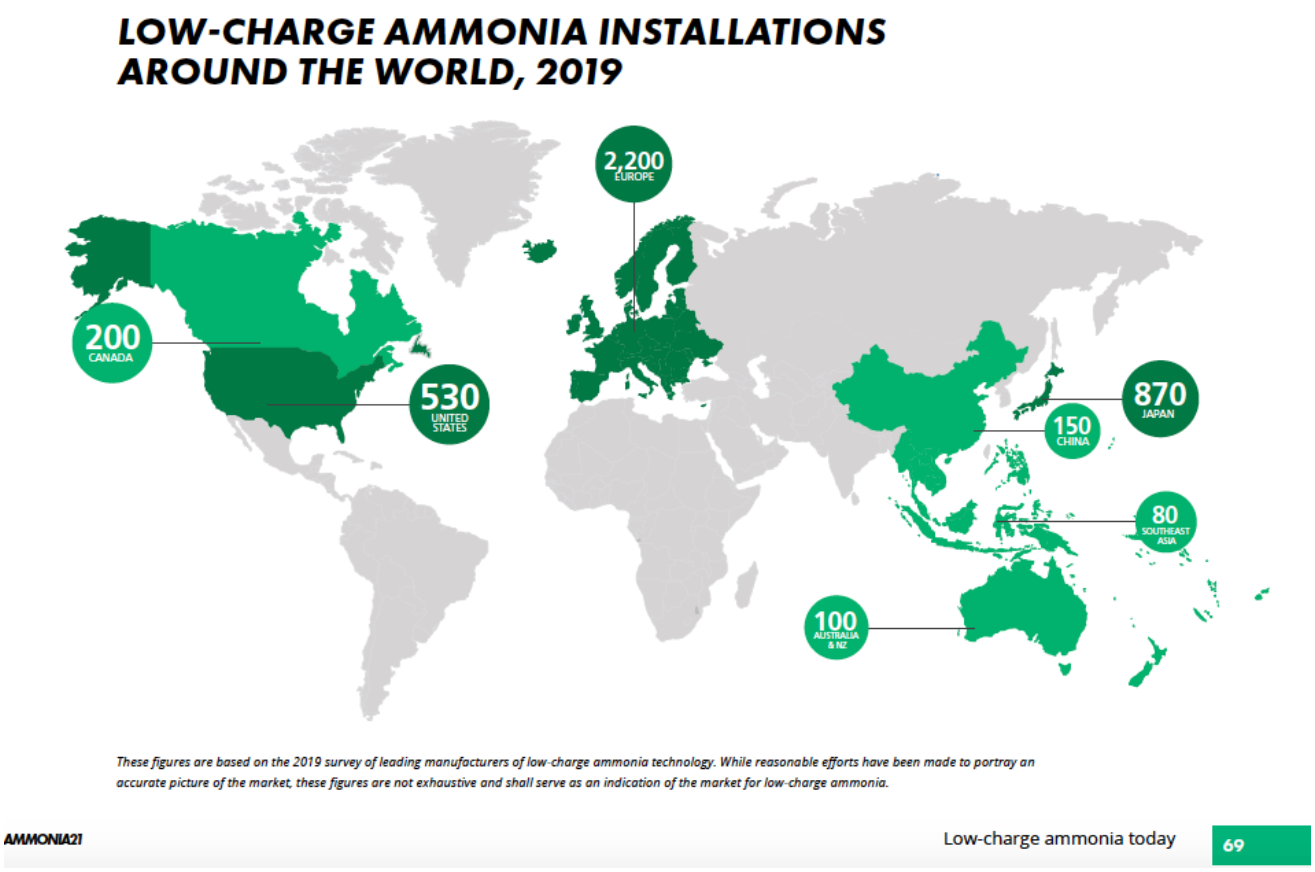
Source: shecco (2020), World Guide to Transcritical CO_2 Refrigeration https://issuu.com/shecco/docs/r744-guide

- Bimbo Bakeries is commissioning its first natural refrigeration equipment – an ammonia/CO_2/glycol system – in one of its fresh bakeries in Chicago. The site was using a direct expansion (DX) system, which were prone to leak into the baking operation. The system had been converted from R22 to R422B, but it continued to leak. It is expected to use up to 440MWh less energy per year than conventional systems, cutting 460 metric tons of CO2e emissions. Based on current prices, this amounts to a US$30,000 saving each year.[2]

[1] Argentine Retailer La Anónima Commits to Transcritical CO2, https://www.r744.com/articles/9802/argentine_retailer_la_anandoacute_nima_commits_to_transcritical_CO_2

[2] Bimbo Bakeries USA Installs First NatRef System for Fresh Bakeries, http://www.ammonia21.com/articles/9801/bimbo_bakeries_usa_installs_first_natref_system_for_fresh_bakeries

Figure 2



Source: shecco (2019), World Guide to Low-Charge Ammonia https://issuu.com/shecco/docs/a21_report_final

"*Companies owning existing systems containing more than 50 pounds of refrigerant in retail food facilities will be required to meet a GWP-Based Company-wide standard – either through a reduction in their company-wide weighted-average GWP to less than 1,400 GWP by 2030, or, in the alternative, reduce their Greenhouse Gas Emission Potential or GHGp by 55 percent by 2030. All non-retail food facilities installing new systems must meet the GWP limit of less than 1,500 or 2,200, depending on the end use.*"

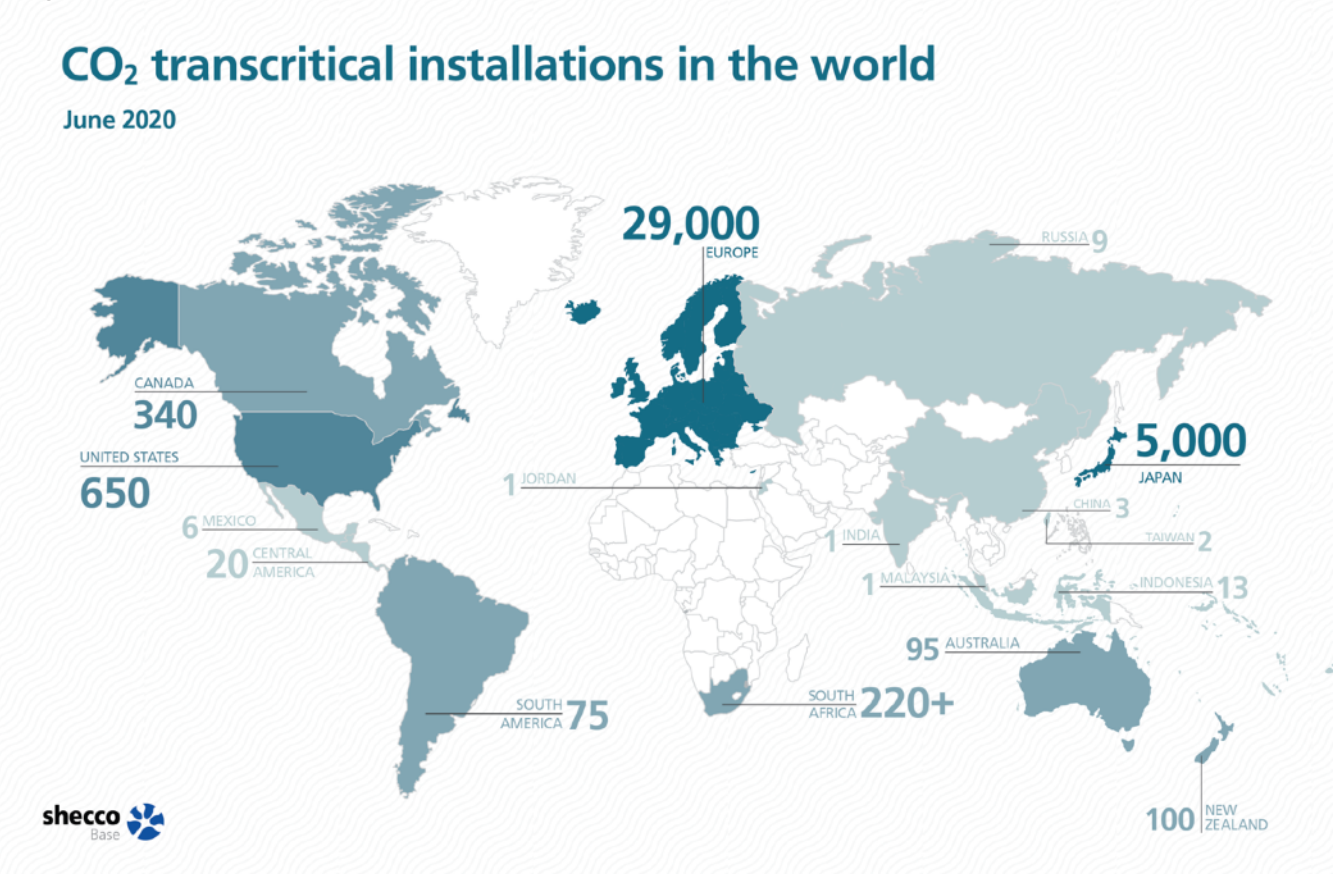
Position Summary

1. Refrigeration systems using HFC-alternative refrigerants are already supported by many large U.S. manufacturers and end-users.
2. U.S. manufacturers are installing more and more natural-refrigerant-based systems each year.
3. Bans should set the pace for advancing technology.

- shecco America Inc. recommends accelerating the ban to avoid further delays in technology transition. We believe that a 2030 timeline is not ambitious enough and this could be brought forward.
- We also believe that the GWP limit for new systems should be further reduced.
- The use of natural-refrigerant-based solutions in this sector is growing in the U.S. with the number of systems successfully manufactured and installed growing rapidly.
- The use of natural refrigerants is advantageous in that it contributes to lowering emissions, which helps companies to achieve corporate sustainability report objectives.
- Firstly, companies are able to cut emissions by replacing fluorinated gases with refrigerants such as isobutane (R600a), R290 and CO_2 (R744) which have zero ozone depleting potential (ODP) and a negligible global warming potential (GWP). Secondly, these refrigerants can be more energy efficient than traditional fluorinated refrigerants.

Commercial Refrigeration Market Data

Figure 3



Source: shecco (2020), World Guide to Transcritical CO_2 Refrigeration https://issuu.com/shecco/docs/r744-guide

In the sector of supermarket refrigeration (commercial refrigeration), the use of state-of-the-art transcritical CO_2 refrigeration is becoming the "standard" rather than the "alternative" technology in many countries, as can be seen in the map in Figure 3. Even the U.S had 650 confirmed transcritical CO_2 installations by June 2020.

As the standard CO_2 transcritical technology for supermarkets has matured, the focus of technological innovation has shifted to the development of optimal solutions for small format stores and warmer ambient climates.[3]

In the U.S, transcritical CO_2 installations have almost doubled since 2018 as seen in the table in Figure 4. While the United States may be behind in terms of the total number of transcritical stores, they are at the forefront of technological advancements with innovative CO_2 installations in warm-ambient climates.

New transcritical installations have been eliminating long-held beliefs about the technology's climate limitations in relation to energy efficiency. As an example:

[3] https://issuu.com/shecco/docs/f-gas_impact_shecco_october2016

- Kysor Warren Epta U.S. has started installing transcritical CO_2 (R744) systems incorporating FTE (Full Transcritical Efficiency) technology in the U.S. All five systems are in new stores. Four of the five stores are located in Alabama, Georgia and South Carolina, which have a hot/humid climate, with ambient temperatures up to 40°C/104°F. The other is located in Tennessee, a moderate climate.[4]
- U.S. OEM Hillphoenix, Conyers, Georgia (U.S.) provided a system for a 75,000ft² (6,968m²) Seed to Table Market, a refurbished Albertsons store that opened in December 2019 in North Naples, Florida, the most southeastern state in the U.S. The system includes three rooftop adiabatic gas coolers from Baltimore Aircoil (BAC), which helps the system function efficiently in the balmy climate of southwest Florida.[5]

Figure 4

Region	Number of transcritical CO_2 installations in 2008	Number of transcritical CO_2 installations in 2018	Number of transcritical CO_2 installations in May 2020	Growth in % (from 2018 to 2020)
Europe	140	>16,000	29,000	81%
U.S.		>370	650	76%
Canada		>245	340	39%
Japan		>3,530	5,000	42%
Australia		>20	95	375%
New Zealand		>40	100	150%
South Africa		>110	>220	100%

Source: shecco (2020), World Guide to Transcritical CO_2 Refrigeration https://issuu.com/shecco/docs/r744-guide

[4] Kysor Warren Epta U.S. to Have Five FTE Transcritical Installations, http://www.r744.com/articles/9835/kysor_warren_epta_u_s_to_have_five_fte_transcritical_installations_in_2020

[5] Transcritical CO_2 in Warm, Muggy Florida, https://accelerate24.news/regions/north-america/transcritical-co2-in-warm-muggy-florida-2/2020/

Light Commercial Refrigeration Market Data

Through the innovation and dedication of large consumer brands, vending machines, ice cream freezers, bottle coolers and refrigerated cabinets all around the world are increasingly cooled by CO_2 and hydrocarbons.

In some cases, natural refrigerants can register savings of up to 33% in energy use in light commercial refrigeration equipment.[6]

There are more than 5.5 million HFC-free light commercial units (both HCs and CO_2) collectively put in the market already by leading consumer brands – Coca Cola Company, PepsiCo, RedBull and Unilever – which have joined the initiative

"Refrigerants, Naturally!".[7] In addition, an increasing number of other consumer brands are choosing hydrocarbons for their point-of-sale equipment (bottle coolers, vending machines, ice cream freezers), often targeting global 100% procurement.

[6] GUIDE to Natural Refrigerants in Japan - State of the Industry 2016, https://issuu.com/shecco/docs/guide_japan-2016

[7] Accelerate Australia & NZ #8, *America's Pledge includes HFC reduction*, https://issuu.com/shecco/docs/1801_aaunz/55

"New air conditioning (AC) equipment used for both residential and non-residential purposes must use refrigerants with a GWP less than 750, effective January 1, 2023."

Position Summary

1. The 750 GWP should be lowered to 150 as suitable technology already exists to support this.
2. A GWP of 750 would lead to an influx of climate-damaging intermediary solutions.
3. Incentives are needed to support this transition and spur local manufacturing and innovation.

- It is our belief that the HVAC&R industry is both willing and able to transition to more climate-friendly alternative solutions within the air-conditioning (AC) sub-sector. This would be a welcome transition, given the high percentage of the market that the AC sub-sector occupies. However, we do have to express our concern that, without subsidies and incentives, a transition by 2023 would be too ambitious.
- Furthermore, we believe that a GWP of 150 would be a more meaningful goal than 750, as suitable technology with this much lower GWP already exist and would avoid an unnecessary intermediary step.
- Many believe that the solution for AC lies in R32, however we caution against its use. Promoted as a "low-GWP" solution, R32's GWP measured over 100 years (GWP_{100}) is only 675. However, this gas stays potent in the atmosphere for about 21.7 years and when its GWP is measured over 20 years (GWP_{20}) instead, it was found to be 2,330.[8] By presenting GWP_{100} data instead of more accurate GWP_{20} data, this is misleading the public as well as policymakers in terms of which refrigerants are actually climate friendly and sustainable.
- Solutions for natural-refrigerant-based AC already exist - both within the residential as well as the non-residential sectors. shecco held a technical conference this summer on AC using natural refrigerants where numerous successful case studies on the matter were presented. All the information can be found here.
- Incentives are essential to accelerate the adoption of natural refrigerant-based technology. From the end-user perspective, especially for small

[8] Kanter, D., Mate, J. 2012. The Benefits of Basing Short Term Climate Protection Policies on the 20 Year GWP of HFCs. Frankfurt, Öko-Recherche GmbH.

and medium-sized businesses and individuals, the 'price tag' is often the decisive factor when purchasing new equipment. Subsidies can alleviate the barriers and provide support while maximizing ozone and climate benefits. Subsidies would also accelerate economies of scale, which would have impact on reduction of cost for such technology over a certain period of time. Furthermore, they are a useful tool to spur local manufacturing and lead the way in new technology.

- Opting for more ambitious targets would spur innovation, give boost to front-runners and ensure California is well ahead with the developments, as the whole world will be looking for HFC alternative solutions ahead of the global HFC phase-down.

Air-conditioning Market Data

In China and India, 20 production lines have already been converted to manufacturing R290 split ACs. "The conversion of existing conventional production lines for R22 or R410A technology can be realized with relatively little investment." Manufacturers who have already transformed their production lines include: Midea, Haier, TCL, Gree, Hisense, Changhong, AUX, and Yair.[9]

India is also showing a growing interest in R290 RAC, with more than 650,000 units currently installed in the market.[10]

According to shecco's estimates from data collected, more than 300,000 portable hydrocarbon AC units have been sold in Europe.[11]

Some examples of existing natural-refrigerant-based, commercially available HVAC technology:

- Polaris manufacturers a HideAway series of ducted packaged air-conditioning units that do not require a separate outdoor unit; as well as its Intelligent Series of split systems with inverter technology. These employ M60, a hydrocarbon refrigerant blend. The highly efficient reverse-cycle Polaris systems are expected to cut energy consumption in excess of 65% compared to the old R22 systems it replaces. The new systems use only 1.2lbs of M60 per HideAway unit, and 4.2lbs per Intelligent Series unit.[12]
- Climate Wizard indirect evaporative cooler runs completely on water (R718) and is made by Australian manufacturer Seeley International. The Climate Wizard can operate in ambient temperatures up to 131°F (55°C) with

[9] GIZ, R290 Split Air Conditioners Resource Guide, https://www.international-climate-initiative.com/fileadmin/Dokumente/2019/R290_SplitAC_ResourceGuide_Proklima.pdf

[10] GIZ, R290 Split Air Conditioners Resource Guide, https://www.international-climate-initiative.com/fileadmin/Dokumente/2019/R290_SplitAC_ResourceGuide_Proklima.pdf

[11] LIFE FRONT Report, Impact of standards on hydrocarbon refrigerants in Europe, https://issuu.com/shecco/docs/impact_of_standards_om_hydrocarbon_

[12] Australian Building Replaces R22 ACs with Hydrocarbon Units, https://accelerate24.news/regions/australian-building-replaces-r22-acs-with-hydrocarbon-units/2020/

an increase in performance the warmer it becomes. It uses a patented counterflow heat exchanger that allows supply temperatures to be delivered at 1.8-5.4°F (-16.78°C to -14.78°C) below the ambient wet bulb temperature. Where Climate Wizard is being used in lieu of a chiller plant, Seeley estimates that the energy saving will be approximately 80% while the peak electrical demand for the site was reduced by 60%.[13]

[13] Evaporating Water for AC, https://accelerate24.news/regions/australia/evaporating-water-for-ac/2020/

For more information, please contact:

Marc Chasserot
CEO, shecco America Inc.
marc.chasserot@shecco.com
Tel : +1 917 724 7813

Ilana Koegelenberg
Market Development Manager, shecco
ilana.koegelenberg@shecco.com
Cell: +32 471 78 58 34