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California Air Resources Board (CARB)

Subject: Public Comment in Support of Variance Request by Vertiv (RE: Prohibitions on Use of Certain Hydrofluorocarbons, 17 CCR §§ 95374 and 95375)

Dear Members of the California Air Resources Board,

I am writing to submit this public comment in strong support of the variance request filed by Vertiv on September 11, 2025, regarding the requirements of California Code of Regulations, Title 17, sections 95374 and 95375. This request seeks a variance from the January 1, 2025, prohibition on refrigerants with a Global Warming Potential (GWP) of 750 or greater, specifically for specialized Computer Room Air Conditioning (CRAC), data center, and Information Technology Equipment Facility (ITEF) cooling equipment.

The transition timeline must be technologically feasible and ensure the safety and reliability of California's essential digital infrastructure. Data centers and ITEFs are mission-critical environments requiring near-continuous 24/7/365 operation with extreme reliability. A review of the evidence, supported by research on manufacturing and engineering challenges, demonstrates that the 2025 deadline is logistically and technologically impossible for this specialized subsector. I urge CARB to grant the requested variance, extending the compliance date to January 1, 2027, to ensure a safe, orderly, and successful transition.

Systemic Supply Chain Constraints and Manufacturing Complexity

The ITEF cooling sector faces unique challenges distinct from the high-volume residential air conditioning market. Data center cooling equipment is characterized by Low-Volume, High-Complexity (LVHC) manufacturing. Unlike commodity production, LVHC manufacturing emphasizes product performance, functionality, and reliability over mass manufacturability (Synnes & Welo, 2016).

The transition to low-GWP refrigerants requires significant redesign of components. However, the ITEF sector accounts for a very small percentage—reportedly less than 4%—of the new refrigerant charge in air conditioning systems nationwide. During an industry-wide technological shift driven by concurrent state and federal regulations (including the AIM Act), major component suppliers have rationally prioritized investments and redesign efforts for their

largest customers and markets.

This prioritization creates significant bottlenecks for niche manufacturers. The transition in LVHC environments requires deep, integrated co-development between the equipment manufacturer and its suppliers (Synnes & Welo, 2016). When suppliers are focused on high-volume markets, their capacity for this intensive, collaborative development with specialized manufacturers is constrained. Consequently, necessary low-GWP components optimized for the extreme demands of data centers have not been made readily available, resulting in delays in securing essential parts like specialized safety shutoff valves and control chips.

The Engineering Realities of the A2L Refrigerant Transition

The shift to low-GWP alternatives often involves transitioning to mildly flammable (A2L) refrigerants. This is not a "drop-in" substitution; it necessitates a comprehensive redesign of the equipment.

The conversion process requires a complex approach to analyze the impact of the new refrigerant on every major system element, including compressor performance, heat exchanger efficiency, and overall system capacity (Molskyi et al., 2025). Fundamental differences in physical and chemical characteristics, such as molar mass, critical pressure, and density, must be addressed through engineering modifications. Furthermore, the transition often necessitates identifying and validating new system lubricants compatible with the new refrigerants to ensure long-term compressor reliability, which is critical for data center equipment (Molskyi et al., 2025).

The use of flammable refrigerants also significantly increases the complexity of the system design. It mandates the integration of new safety components, such as leak detection sensors and safety shutoff valves, and requires additional approvals and specialized technician training. This rigorous engineering cycle—from redesign and testing to validation and certification—is necessary to ensure safe deployment and cannot be completed within the timeframe allowed under 17 CCR § 95374(c).

The Critical Lag in Safety Standards and Building Code Adoption

A significant impediment to the 2025 deadline is the multi-year lag between the publication of necessary technical safety standards and their legal adoption into enforceable building codes. Applicable standards and codes for A2L refrigerants have not yet been widely adopted or implemented to allow for their safe use in ITEF environments.

The foundational safety standards required for this transition were only recently finalized. The UL 60335-2-40 4th Edition product safety standard, which addresses the unique challenges

of ITEF cooling applications and allows sufficient charge amounts for data centers, was not published until December 15, 2022. The corresponding installation safety standard, ASHRAE 15-2022 Addendum t, was published even later, on May 31, 2024.

These technical standards must next be incorporated into model codes by the International Code Council (ICC). The ICC operates on a 3-year cycle, meaning the next opportunity for these changes to be adopted will not be until the 2027 code cycle. Following this, individual states must take time to adopt these changes. This creates substantial ambiguity regarding the applicable building codes required to safely design a data center utilizing A2L refrigerants between now and 2027. It is impossible for manufacturers to comply with the 2025 deadline when the governing safety standards have only just been published and the building codes necessary for legal installation do not yet exist.

The Necessity of Regulatory Harmonization

I urge CARB to align its compliance date with the federal precedent established by the U.S. Environmental Protection Agency (EPA). The EPA, under the AIM Act, conducted a comprehensive review, taking into account technological achievability, commercial demands, safety, consumer costs, building codes, and other relevant factors.

The EPA finalized a compliance date of January 1, 2027, for this subsector. In doing so, the EPA recognized the impact of the recent safety standard updates, noting that the additional time will enable updates to the UL standard and future harmonizing updates to ASHRAE-15-2022 to be incorporated, increasing the number of available substitutes by January 1, 2027.

A variance aligning CARB standards with the EPA's January 1, 2027, deadline is a logical and prudent regulatory strategy. Maintaining an earlier deadline in California creates regulatory misalignment, strains finite R&D resources, and risks interrupting the supply of essential cooling equipment for California's critical infrastructure.

Conclusion

The challenges facing the ITEF cooling sector in meeting the 2025 deadline are systemic and technologically grounded. The requested variance is necessitated by the realities of low-volume, high-complexity manufacturing (Synnes & Welo, 2016), the complexities of engineering redesign required for A2L refrigerants (Molskyi et al., 2025), and the procedural timeline of safety code adoption.

I strongly support Vertiv's request for a variance until January 1, 2027. Granting this variance is a pragmatic approach that ensures the transition to low-GWP technologies proceeds safely and successfully without compromising the stability of California's critical digital

infrastructure.

Thank you for the opportunity to comment on this important matter.

Sincerely,

A handwritten signature in black ink, appearing to read "Quinn Rickert". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Quinn Rickert

References

- Molskyi, S. M., Molskyi, O. S., & Vorontsova, A. L. (2025). Complex approach to the conversion of existing refrigeration systems to A2L group refrigerants. *Journal of Mechanical Engineering – Problemy Mashynobuduvannia*, 28(1), 19–32. <https://doi.org/10.15407/pmach2025.01.019>
- Synnes, E. L., & Welo, T. (2016). Bridging the gap between high and low-volume production through enhancement of integrative capabilities. *Procedia Manufacturing*, 5, 26–40. <https://doi.org/10.1016/j.promfg.2016.08.006>