EPA's Proposed Technical Transitions Rule: Computer Room, Data Center and Information Technology Equipment Facility (ITEF) Air Conditioning

John Niemann

Senior Vice President, Thermal Product Development/ Engineering, Global

August 8, 2023

Additional Attendees

Vertiv Engineering:

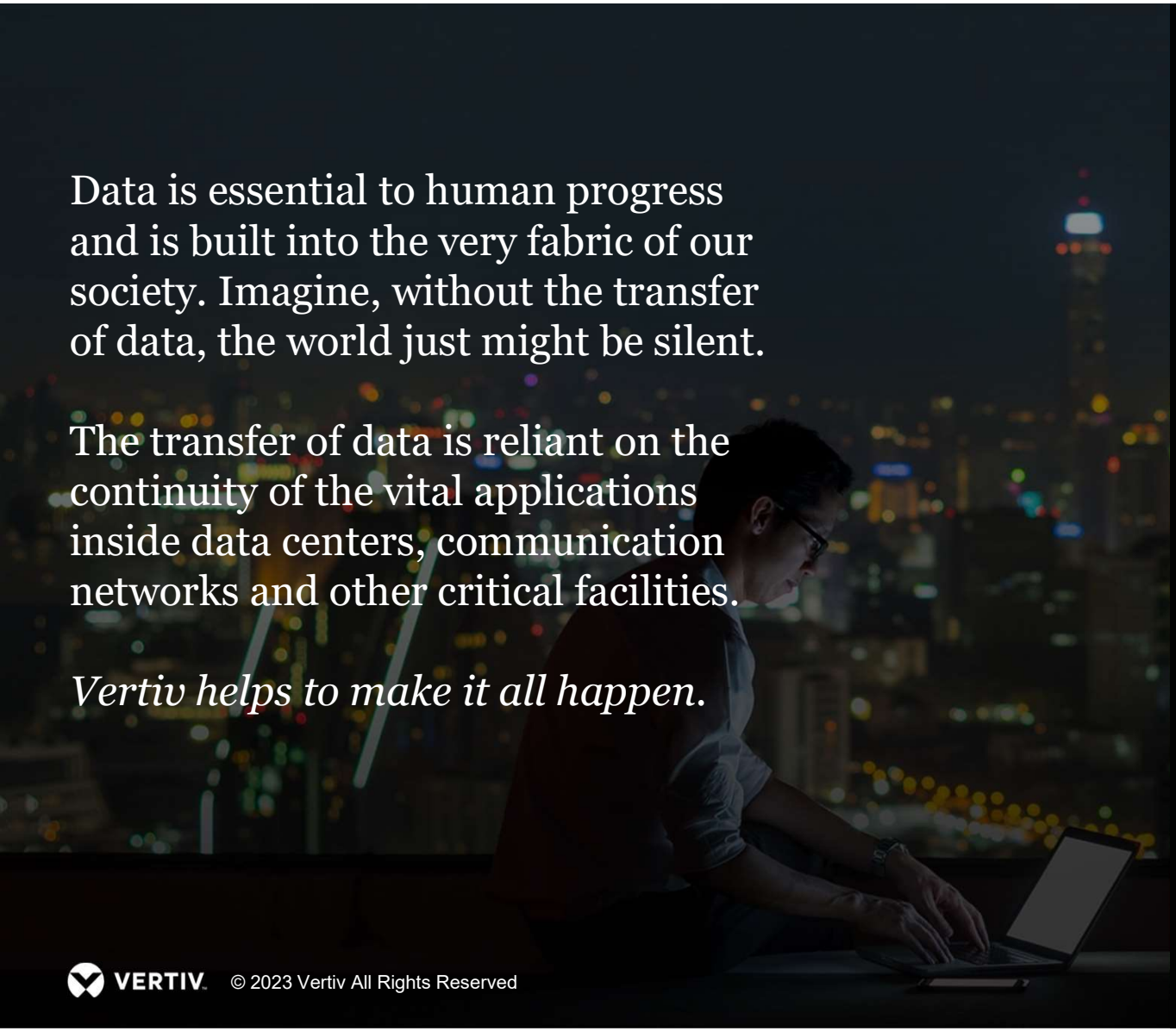
- Ben Dolcich
- Bill Kinas
- Lisa Saponaro

Codes & Standards International:

- Greg Johnson
- Jay Peters

Crowell & Moring LLP:

- Robert Meyers



Data is essential to human progress and is built into the very fabric of our society. Imagine, without the transfer of data, the world just might be silent.

The transfer of data is reliant on the continuity of the vital applications inside data centers, communication networks and other critical facilities.

Vertiv helps to make it all happen.

We do this by:

Bringing together hardware, software, analytics and services.

Enabling uninterrupted operations, optimal performance and scalability.

Doing it differently through visionary expertise, immersive collaboration, relentless agility, intelligent ecosystems and scalability.

Architects of Continuity™

Vertiv Portfolio

POWER MANAGEMENT

Description

- Small, medium and large uninterruptible power systems (UPS)
- Industrial-grade UPS
- AC power distribution systems and busway
- Switchgear and Busbar
- 12V to 400V DC and HVDC power systems
- Custom DC UPS systems, DC battery chargers and distribution
- Rack power distribution

Select offerings

Brands

Liebert® Geist™ NetSure™

E+I ENGINEERING GROUP PowerBar pb™

THERMAL MANAGEMENT

- Small thermal systems including room and row/ rack cooling
- Air handling and chiller: large systems located outside the data room that provide climate control

Liebert® Energy Labs A VERTIV Company

Largest Revenue of the portfolio Impacted by new Regulations

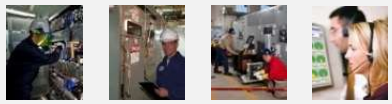
INTEGRATED RACK SOLUTIONS

- IT and infrastructure management solutions
- Rack PDUs
- Integrated solutions

VERTIV.
Avocent® Cybex™
Albér™

SERVICES

- Diverse array of services to handle ongoing customer equipment and product needs
- Maintenance, project and training services
- Tailored customer offerings



VERTIV.

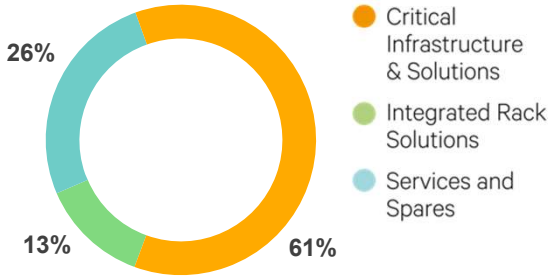
Vertiv at-a-glance – Fiscal 2022

Sales
~$5.7B

Employees
Vertiv ~27,000

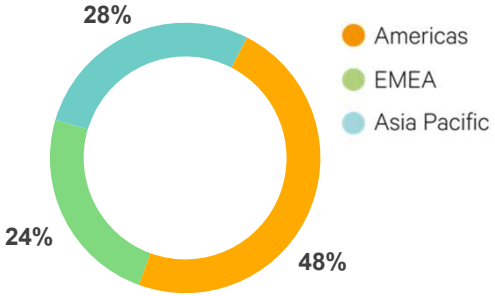
Customers Include
Alibaba, Alstom, América Móvil, AT&T, China Mobile, Equinix, Ericsson, Reliance, Siemens, Telefonica, Tencent, Verizon, Vodafone

Manufacturing Sites: 24
Service Centers: 220+
Reach: 130+ countries



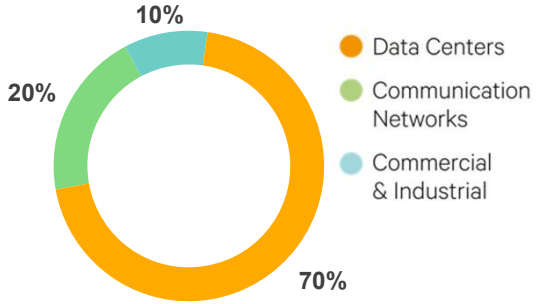
Offering*

Broad range of power, thermal, and IT and edge infrastructure, solutions and services portfolio



Geography*

Global, well-established footprint, and supply-chain network



End Market*

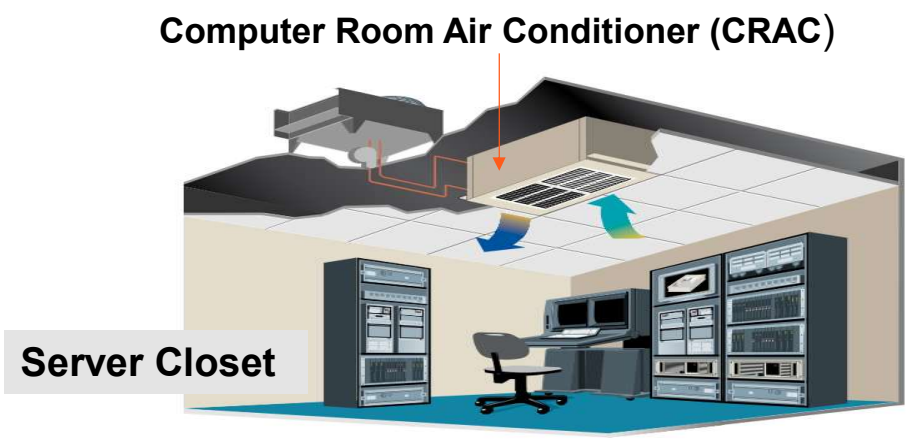
Customers who operate in some of the world's most critical industries

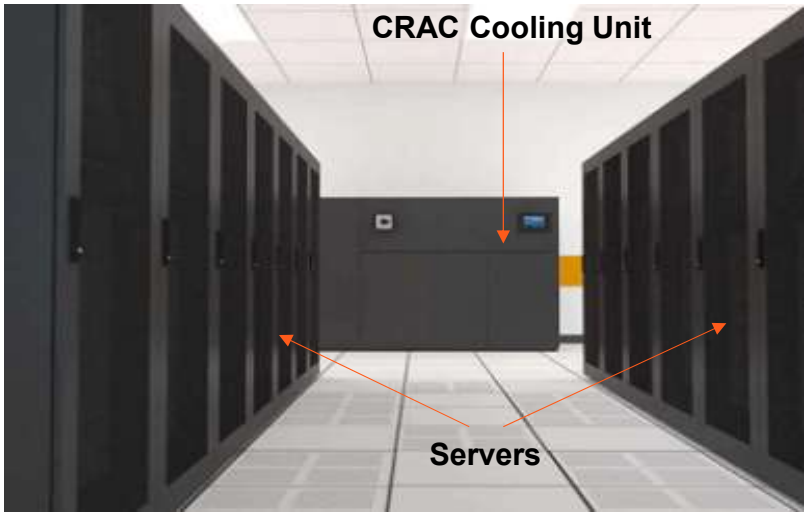
Market breakdown rounded to nearest 5%

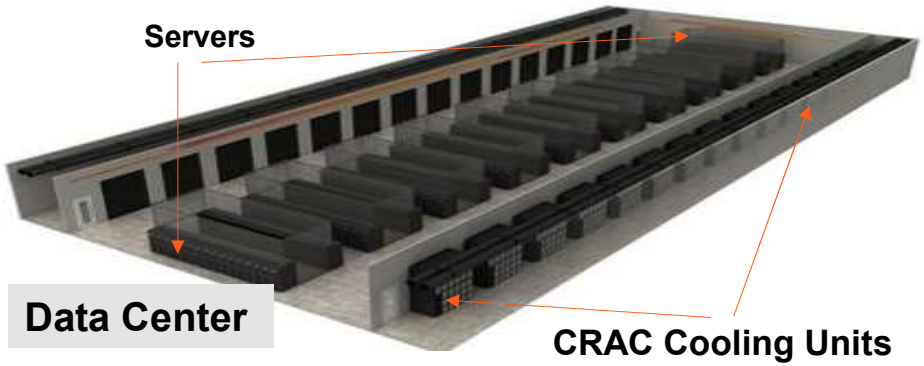
*by revenue

Our focus on *data centers*

Information Technology Equipment Facilities(ITEF) and Computer Room Air Conditioners





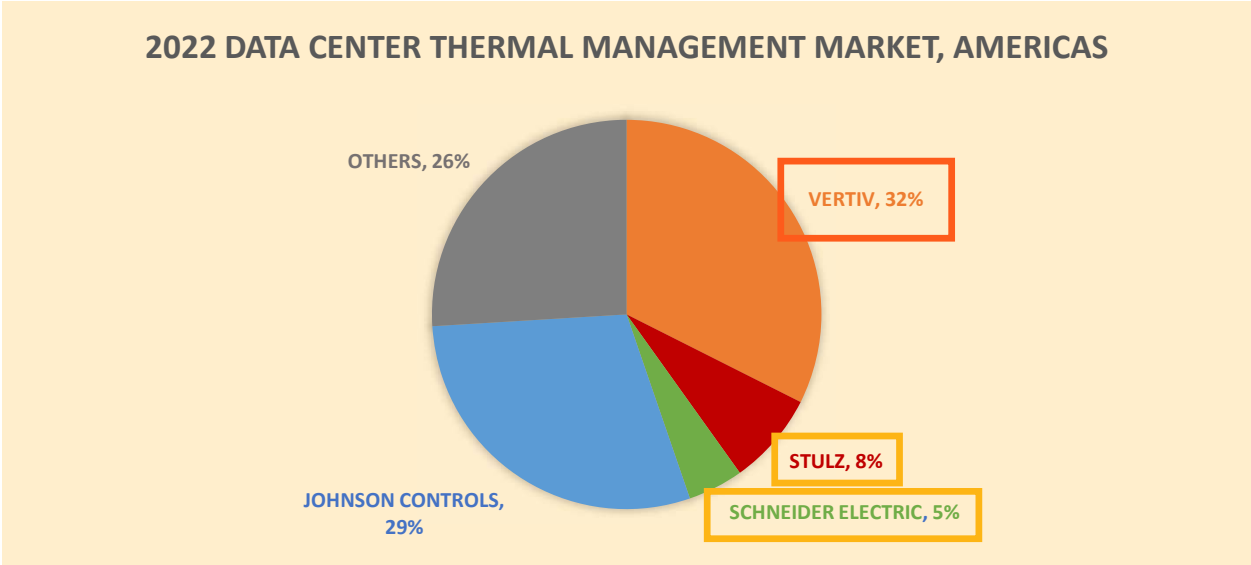


Information Technology Equipment Facility (ITEF)

ITEF, Data Centers, and Computer Rooms are Vital Economic Sector

Size, Utilization and Importance to Critical Sectors of U.S. Economy

- Currently, there are 142 million square feet of data centers in the U.S. As of 2022, Digital Realty, Meta, Google, and Microsoft constitute 48% of this space (Source: OMDIA).
- Datacenters' Capital Expenditures in 2022 totaled $37B globally with $18.9B in the U.S. (Source: OMDIA).



As of 2022, Vertiv comprises 32% of total Americas market share for the data center cooling industry, the largest single contributing manufacturer; many other companies support alternative approach.
(Source: Dell'Orro Data Center Physical Infrastructure World Wide Report, 2023)

ITEF Unique Design Attributes

- ITEFs are secured locations with very low occupancy and highly trained service technicians
- ITEFs range in size up to 100,000 sq ft or more. Often as one large air-conditioned room (likened to warehouses with concrete floor to truss height range from 10-20 feet depending on application).
- ITEF internally generated heat load is 5-10 times greater per square foot than comfort cooling, but use the same refrigerants
- ITEF *load grows overtime* and may require new cooling equipment be added incrementally over a 25-year lifespan

Why are we here?

- **The proposed American Innovation and Manufacturing Act (AIM Act) regulations affecting ITEF are infeasible and out of step with product development time and adoption of critical safety standards and national building codes**

- **Choice of refrigerants and/or compatible cooling equipment that can be used in computer rooms, datacenters and ITEFs will be substantially and unnecessarily constrained**

- **Requested EPA to consider a range of regulatory alternatives that will avoid negative economic, technological and security consequences stemming from the HFC phasedown to allow for a "safe and smooth transition" to alternative, low-GWP refrigerants in the computer room, datacenter and ITEF sector**

Vertiv Concerns Regarding Proposed Rule

Substantive

- CRAC, Data Centers and ITEF cooling systems are distinctly different from other end uses proposed to be regulated under the AIM Act. They serve critical economic, national security and health care interests; extremely high reliability is demanded by customers and necessary (e.g., 911 call centers).
- EPA's proposed GWP limit of either 150 or 300 along with compliance dates for manufacturers of January 1, 2025 and prohibiting installation after January 1, 2026 are simply not feasible. This could jeopardize the availability of new equipment for mission-critical applications.
- EPA's proposed rule allows 700 GWP limit for products using similar refrigerants for different end uses
- EPA's proposed rule illogically maintains separate end use categories for such non-critical sectors as vending machines, ice rinks, water coolers and ice machines -- yet lumps vastly larger and different CRAC, Data Centers and ITEF within much larger IPR chemical, pharmaceutical and manufacturing industries.
- Industry has been conscientious in efforts to get safety standards and construction codes updated to address new low GWP A2L flammable refrigerants, but such standards and building and fire codes will not be published until 2027 for CRAC, Data Centers and ITEF (much less adopted by states and localities) and will not accommodate EPA's proposed compliance dates.

Vertiv Concerns Regarding Proposed Rule

Procedural

In EPA's proposed rule, "data centers and data servers" and "data centers, server farms" were briefly mentioned in *preamble only* (87 Fed. Reg. at 76,774, 76,786 (Dec. 21, 2022)) as potentially being included within Industrial Process Refrigeration (IPR) and thus subject to IPR limits on GWP.

- But EPA did not define these terms and NO regulatory definitions or text was provided within rule or docket for public comment.

- The use of refrigerants in IPR is regulated under a different *Clean Air Act* program for ozone depleting substances, the Significant New Alternative Program (SNAP). Within SNAP, EPA has previously defined IPR as applying to "chemical, pharmaceutical, petrochemical and manufacturing industries" as well as industrial ice machines, electrical generation appliances and ice rinks.

- There is also no TSD, qualitative technical rationale, or other explanation within this proposed *AIM Act rule (*or contained the docket) as to why EPA is proposing, for the first time, to consider CRAC, Data Centers or ITEF as fitting within IPR. Neither is there any explanation as to why EPA might consider IPR to be the same or different for purposes of SNAP or the AIM Act technical transition program.

Vertiv/Industry Proposed Alternative

Final Rule Elements

Create New Sector *or* Include as Subsector Within Existing Refrigeration & Air Conditioning Sector (*i.e., do not include within IPR*)	**GWP Limit**	**Compliance Date**
Information Technology Equipment Facilities, Data Centers, and Computer Rooms	700	January 1, 2029

EPA Received Comments from Large Proportion of U.S. Industry

Near-Universal Support for Alternative Approach

AHRI – the trade association representing manufacturers of heating ventilation, air conditioning, commercial refrigeration (HVACR), and water heating equipment

ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

IAPMO – International Association of Plumbing & Mechanical Officials

Stulz – CRAC manufacturer

Schneider Electric – CRAC manufacturer

Emerson/Copeland – compressor manufacturer

Joe Hale – Principal at 2020 Engineering, LLC

Savannah River Nuclear Solutions – nuclear materials management

Codes and Standards International – global consultant

Daikin – manufacturer of residential, commercial, and industrial HVAC equipment

Munters – manufacturer of mission critical HVAC equipment

Comments Submitted for Record Concerning Deficiencies in EPA's Analysis

Multiple assumptions are applied to this unique application that simply do not apply

EPA Invited Comment on Additional Sectors/Subsectors -- But Failed To Define Proposed Sectors and Subsectors

> "EPA acknowledges that historical contexts may not fully capture all the ways that regulated substances are being used and is seeking comment on additional sectors and subsectors where regulated substances are used that would fit under this regulatory program." Proposed Rule, 87 Fed. Reg. at 76,754.

Regulatory Sectors/Subsectors Must be Reasonably Justified and Aligned with End Use

- Historically, within SNAP, EPA has recognized many discrete end uses (*e.g.*, commercial ice machines, ice skating rinks, vending machines, residential dehumidifiers, water coolers) even while they may utilize similar refrigerants.
- The design, characteristics and use of CRAC, Data Centers and ITEF fully support differential consideration/treatment. This equipment is specifically designed for its intended use and is subject to specialized requirements.
- In proposed rule, EPA did not explain how data centers or chillers used in "server farms" are similar to chemical production, pharmaceutical, petrochemical, or manufacturing and therefore should be included within IPR.

Vertiv Comments at 5-8, Codes and Standards International at 2, AHRI at 17-19, Emerson at 4-5.

Deficiencies of EPA's Economic Analysis of ITEF

Size, Utilization and Importance to Critical Sectors of U.S. Economy

- EPA fails to assess the economic impact of proposed rule on CRAC, Data Centers and ITEF; rather EPA merely examined at a high level "the more rapid and more comprehensive transition to cost-saving lower-GWP technologies in particular sectors and subsectors required by the rule." Costs and Environmental Impacts TSD at 28. It does not appear that EPA conducted any modeling that considered transition regarding IPR. *Id.,* Table 3-2.

- At same time, EPA recognizes discrete end uses that may utilize similar refrigerants that are not nearly as critical for every day life but treats these end uses as individual subsectors, with targeted requirements.
  - The US Ice Making Machine Industry recognized $963.7M in revenue in 2022. (https://www.ibisworld.com/industry-statistics/market-size/ice-making-machine-manufacturing-united-states/)
  - The US Ice Rink Industry market was forecast to be $500.9M in 2022. (https://www.statista.com/statistics/1176144/ice-rink-industry-market-size-us/)

ITEF, Data Centers, and Computer Rooms are not IPR Facilities

Characteristics of ITEF, Data Centers, and Computer Rooms Versus IPR

- Mission critical applications require redundancy of equipment (*e.g.*, if extremely mission-critical application, 2x # of cooling units (and sometimes 2x # of back-up generators)).
- Involve 24/7/365 operation with extreme requirements for reliability (*e.g.*, Tier 4 facilities can have no more than 26.3 minutes of downtime *per year*, resulting in 99.995% uptime). No planned downtime.
- Essential to health care, global financial systems and other national security applications.
- Distinctly different from manufacturing and industrial facilities in terms of custom design and use.
- Many areas housing data centers require additional levels of security and may have zero human occupancy.
- Rising application temperatures as server technology evolves (i.e. some indoor supply air temperatures above 100°F).

Vertiv Comments at 4-5, Savannah River Nuclear Solutions at 3, Codes and Standards International at 1-2, Munters at 1-2, Schneider Electric at 2, Emerson at 4-5.

EPA Provided No Explanation for Preferential Treatment of Chillers

Many System Types Exist for CRAC, Data Centers and ITEF

- EPA briefly mentions data centers and “server farms” in connection with chillers with no further explanation. 87 Fed. Reg at 78,786.

- But equipment types and sizes for CRAC, Data Centers and ITEF vary widely, ranging from ½ ton up to hundreds of tons of cooling required
  - Chilled water systems (outdoor, packaged air-cooled and indoor water-cooled chillers with Computer Room Air Handling (CRAH) units)
  - Split air-cooling systems (indoor CRAC paired with outdoor condenser or condensing unit)
  - Single packaged air-cooling systems (rooftop or fluid-cooled condenser)
  - Emerging technology using full immersion fluid and direct-to-chip cooling

Vertiv Comments at 2. Schneider at 1-2.

Time is Needed to Address Mandatory Factors For Technology Transition Rules

> [T]he Act directs EPA to factor in 'the availability of substitutes for use of the regulated substance that is the subject of the rulemaking or petition, as applicable, in a sector or subsector, taking into account technological achievability, commercial demands, safety, consumer costs, building codes, appliance efficiency standards, contractor training costs and other relevant factors . . . 87 Fed. Reg. at 76,757.

Safety (standards)

- UL 60335-2-40 4th edition has separately categorized ITEF application and was only recently published on December 15, 2022
- ASHRAE 15 is currently still under review and incorporating a newly-drafted section to address flammable A2L refrigerants in this application and has yet to be published
- Due to components not being available, industry has yet to build prototypes and do the appropriate amount of certified safety tests to UL standards
- Third party certifying safety test labs will be inundated with exorbitant requests for newly-designed equipment

Vertiv Comments at 7-8, AHRI at 17-19, Stulz at 1-2.

Transition Must Take Into Account New Building Codes

Building codes

- UL 60335-2-40 4th and ASHRAE 15 are applicable standards that still need to be finalized.
- ASHRAE 15 is currently under review and incorporating newly-drafted language to address flammable A2L refrigerants in this application. The public comment process on proposed changes is not complete and final language has yet to be published.
- International Code Council (ICC) 2024 code recognized definition of ITEF with details of this application to be included in 2027.
- Multiple building, mechanical and fire codes are affected and also need to be changed.
- State and local jurisdictions will need to adopt the 2027 code through administrative rules or legislative processes, which can take three or more years for state jurisdictions.
- In addition, authorities having jurisdiction will need training to get trained and updated on new standards and codes regarding flammable A2L refrigerants

Vertiv Comments at 8, Savannah River Nuclear Solutions at 2, ASHRAE at 2, Schneider Electric at 3, Emerson at 5, Alta at 2, Johnson Controls at 2, IAMPO at 1.

Equipment Redesign for ITEF, Data Centers, and Computer Room Cooling Equipment is Difficult and Requires Additional Time

Many factors need to be considered, particularly if equipment is to utilize flammable A2L refrigerants

- High operating temperatures/pressures versus refrigeration and comfort cooling
- Specialized (and relatively small) share of equipment manufacturer's market
- Hundreds of different models utilized
- Minimum equipment efficiency metrics set by DOE
- To date, no industry group has tested flammable refrigerants in ITEF, data centers, or computer rooms.
- Safety standards and construction codes are still in the process of being updated to address flammable refrigerant leakage in this unique application

Vertiv Comments at 6-8, Stulz-ATS at 2,
AHRI at 17-19, Munters at 2.

Mandatory Factors Needing Further Consideration For Technology Transition Rules

Appliance efficiency standards

- DOE separately recognizes CRAC equipment as “Air Conditioners and Heat Pumps – Computer Room Air Conditioners” (chillers are currently out of scope of DOE Title 10, CFR 431.97).
- Minimum efficiency levels are currently proposed to be updated to ASHRAE 90.1-2019 in 2024.
- Near future minimum efficiency values took ~3 years of industry collaboration to develop, based on current highly-efficient technology, so new alternative refrigerant designs are being planned to be at the same or better efficiency than what is being adopted by DOE.

Vertiv Comments at 7. Stulz at 1.

Mandatory Factors Needing Further Consideration For Technology Transition Rules

Consumer costs

- New A2L flammable refrigerants are not direct drop-ins to existing systems. Equipment redesign is required to minimize footprint, accommodate new safety requirements and meet strict Department of Energy (DOE) efficiency requirements. All these actions are costly.
- In addition, design engineers will need training to get trained and updated on new standards and codes regarding flammable A2L refrigerants.

Commercial demands

- Customers will use lower GWP equipment, but will want to be certain of safety requirements as well as any changes in state and local regulations.
- Suppliers do not have critical components available for use with flammable A2L refrigerants in this application.

Vertiv Comments at 7-8, AHRI at 17-19, Stulz at 1-2.

Mandatory Factors Needing Further Consideration For Technology Transition Rules

Technological achievability

- Although regulations define only GWP maximum limits in an effort to allow flexibility and innovation, using flammable A2L refrigerants for CRAC, Data Centers and ITEF cooling equipment requires equipment redesign in order to satisfy operational requirements (e.g., operating temperatures and internal system pressure)

- Any industry planning prior to the rulemaking has centered on 750 GWP, but the lower limits proposed (150 or 300 GWP) largely negates this effort. Investment in new research and development will not take place until final rule is promulgated, leaving 14 months to comply for factory-charged units and barely 2 months for split systems (based on assumed October 2023 final rule date).

Vertiv Comments at 6, ALTA at 3, Emerson at 3.

Mandatory Factors for Technology Transition Rules

Contractor training costs

- No industry group has safety tested flammable A2L refrigerant leaks in an ITEF, Data Center or computer room applications
- Specialized technicians will need to learn new safety protocols

Air Conditioning Contractors Comments at 3.

Reclaim

- Use of reclaim for new charging of equipment is not current standard practice for manufacturers and accounts for a near zero percentage of service charge
- Some data center cooling service contracts do not allow the use of reclaimed refrigerant

FluoroFusion Comments at 3.


VERTIV.