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Vertiv Response to TN238233 - Nonresidential Computer Room Efficiency Code Change Recommendations

Additional submitted attachment is included below.

June 21, 2021
California Energy Commission
1516 Ninth Street, MS 34
Sacramento, CA 95814

RE: Docket No. 21-BSTD-01 – 2022 Energy Code Update Rulemaking; *Nonresidential Computer Room Efficiency Code Change Recommendations*

Vertiv Group Corporation ("Vertiv") submits these comments in response to Comment #238233 in this docket and the materials contained therein (collectively, the "Comment"), which was submitted to the California Energy Commission (the "Commission") on June 16, 2021.

Vertiv appreciates the opportunity to raise public concerns with regard to the proposed changes to the 2022 Title 24 Energy Code. Particular to data centers and computer rooms, it is important to have clear code language that is sensitive to the mission critical nature of these spaces and the specific requirements that these distinct cooling systems have.

Vertiv supports adopting the current draft language as it is written in the Express Terms. Vertiv's proposal to add pumped refrigerant economizers into Title 24 as a prescriptive requirement was intended to provide more flexibility for data center owners in the state of California by adding another economizer option that consumes zero water. However, the report contained in the Comment creates barriers to this market flexibility and is based on incomplete and flawed analysis, as further explained herein.

As important context, the Comment continually and mistakenly states that Vertiv's proposal showed the pumped refrigerant economizer to be energy equivalent to a water economizer. Rather, Vertiv's proposal showed the pumped refrigerant economizer to be *more* efficient than a baseline water economizer system. As such, the basis for the Comment's additional metric of minimum equipment efficiency values is flawed because federally-minimum compliant equipment could still show energy savings versus a baseline water economizer.

In addition to this general flaw, the following aspects of the Comment inappropriately move the target *only* for pumped refrigerant economizers:

1) First, the Comment seeks to isolate the proposed refrigerant cooling system's economizer-only performance to equalize the overall system performance during non-economizer mode operating hours throughout the year. This is contrary to the Commission's preferred method of documenting a proposed submeasure's cost-effectiveness and energy efficiency by using CBECC-Com (California Building Energy Code Compliance), or another approved software method to "perform the annual energy analysis comparing its energy efficiency relative to the 2016/2019 Standards." *See* http://bees.archenergy.com/index.html.
2) Next, the Comment includes a request to "equalize" the performance of one component, the evaporator fan, between the baseline water economizer system and the proposed pumped refrigerant economizer system to negate the inherent performance advantage of the entire proposed refrigerant cooling system. This approach is impossible to justify because the evaporator fan is an integral part of the overall system. Further, this approach is wholly inappropriate because the refrigerant economizer can only be used with the

modeled evaporator fan and cannot be installed with any other cooling system. As such, the proposed metric does not "level the playing field" with respect to other technologies but instead creates negative impacts to artificially disadvantage the proposed pumped refrigerant technology. This runs counter to Title 24's technology-neutral intent.

3) Additionally, the Comment's analysis only uses the annualized energy savings data provided with Vertiv's proposal, which includes a 40°F economizer threshold for an equivalent water economizer, as taken from 2019 Title 24 Energy Code. The Comment's use of this data compared to a baseline water economizer with a 50°F economizer threshold used in the CASE proposal for 2022 Title 24 generates a grossly misleading bar chart in Figure 1 because the data sets shown by that chart do not compare performance at the same economizer temperature threshold. The Comment does not clarify this discrepancy. As a result, Vertiv's proposal reflects a lower number of hours in 100% economizer mode (because it is capped at 40°F), whereas the compared baseline water economizer data captures more hours in 100% economizer mode up to 50°F. To generate this data, the Comment had to have made unsubstantiated assumptions regarding the performance of Vertiv's equipment at outside temperatures between 40°F and 50°F. The Comment incorrectly assumed, without consulting Vertiv, that Vertiv's energy model reflected energy consumption at 100% economizer mode up to 50°F. Thus, the pumped refrigerant economizer appears substantially less efficient in this skewed misrepresentation of the data.
4) Most importantly, the Comment proposes to add an efficiency metric to the refrigerant economizer prescriptive requirement: the AHRI design point representative only of one, single test point in 100% compressor cooling mode at one summer outdoor air condition. However, this AHRI metric is intended as an equalizer for manufacturers to certify their products under the AHRI Datacom Cooling Certification Program and does not account *in any way* for the cooling equipment's annualized performance. *See* https://www.ahrinet.org/App_Content/ahri/files/Certification/ResourcesForms/WHY_CERTIFY_FLYER-2020.pdf. Additionally, this AHRI metric, when applied as intended, does not indicate whether an economizer is included in the product to which the metric is applied, which directly conflicts with the Commenter's original desire to divorce the economizer mode performance from the cooling mode performance.

The Comment's proposed addition of a table of "Minimum Pumped Refrigerant Economizer CRAC Net Sensible COP by Climate Zone" should not be considered for the following reasons:

- The values in the proposed "Minimum Pumped Refrigerant Economizer CRAC Net Sensible COP by Climate Zone" table reference the AHRI 1360, 2017 Standard for Performance Rating of Computer and Data Processing Room Air Conditioners, which identifies the test inputs including an External Static Pressure (ESP) = 0.2" for Downflow units and MERV8 filters. By contrast, the energy model included in Vertiv's proposal was run with an elevated ESP = 0.75" to account for additional simulated ductwork for air distribution or containment, and it included higher efficiency MERV13 filters in compliance with 2019 California Green Building Standards Code Section 5.504.5.3 Filters, 2019 Title 24 Section 120.1(c) 1.B., and 2019 California Mechanical Code Chapter 4 Section 401.2. These inputs used in Vertiv's proposal are more conservative than what AHRI 1360 requires. This means that the

Commenter built a table of values that inaccurately assumes the inputs to the Vertiv data set were taken from the Test Method described within AHRI 1360. This inaccuracy makes invalid any attempt to establish a tie between the Commenter's proposed minimum efficiency values and AHRI Standard 1360.

- The values in the proposed table also assume an 85°F Return Air temperature, which is the input from AHRI Standard 1360; however, the report attempts to justify an elevated economizer temperature for refrigerant economizers by increasing the Return Air temperature to 95°F. The Commenter changes their expectation of an appropriate design Return Air temperature from 85°F when making the argument for AHRI 1360-based minimum efficiency levels and then moves up to 95°F when arguing that pumped refrigerant economizers should have an economizer threshold up at 65°F. This change is inappropriate and results in a metric target that contains more than one value for the same input, with which no product can comply.
- Because the Comment's proposed minimum efficiency values only take Full Load operation into account, the Comment completely throws out any annual energy performance that has been provided to the Commission for a true evaluation of the pumped refrigerant economizer proposal and ignores the process that the Commission employs to evaluate submeasure proposals. The Comment's calculated NSenCOP values eliminate any recognition of the proposed pumped refrigerant economizer's performance in economizer mode.
- The table's proposed acceptable minimum proposed efficiency level for Climate Zone 7 is below the ASHRAE 90.1-2019 minimum NSenCOP efficiency value = 2.36 for this size unit. The ASHRAE 90.1-2019 minimum efficiency values are well-reported and widely expected to be adopted within the next 18 months by the U.S. Department of Energy ("DOE") for federal appliance energy conservation standards applicable to the products at issue here. *See* https://www.federalregister.gov/documents/2021/04/21/2021-08203/preliminary-analysis-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2019.
- The proposed acceptable minimum efficiency level for Climate Zone 1 is more than double the ASHRAE 90.1-2019 minimum NSenCOP efficiency value = 2.36 for this size of unit, which has been well-reported and is widely expected to be adopted by the DOE later this year, as noted in the Federal Register entry linked above. Imposing such an elevated minimum value discourages manufacturers from developing innovative, emergent technologies. The minimum efficiency values within ASHRAE 90.1 are evaluated with each 3-year cycle and generated with input from industry experts to set aggressive targets for manufacturers to develop new and increasingly efficient technologies. Increasing these minimums by a factor of 200% moves that already intentionally aggressive target and creates an unnecessarily heavy burden on innovators. Further, this disrupts ASHRAE's carefully developed and well-documented industry guidance that is specifically established to balance aggressive targets with flexibility for new and promising technologies.
- If the metrics proposed in this table are approved, they will continue to push data center designers to favor the use of one of the two currently listed prescriptive economizer options, which are not ideal technologies for all data centers. For example, air economizers provide optimum payback only when outdoor air conditions are pollutant and smog-free so as to not degrade the performance of the servers within the data centers utilizing them,

which has been a genuine concern for residents of California in the past several years. *See, e.g.,* ASHRAE RP-1755, February 2020 Controlling Data Centers' Air Pollution, Environmental Control to Ensure Equipment, Systems Reliability. Additionally, data centers that use water-cooled systems are gaining attention for the impacts of that use. For example, such systems have been described as an "irresponsible use of our water" in Arizona, negative environmental impacts have been reportedly observed in other states, and Microsoft has set water consumption metrics as part of their corporate conservation goals, including for their data centers. *See* https://www.nbcnews.com/tech/internet/drought-stricken-communities-push-back-against-data-centers-n1271344. By contrast, pumped refrigerant economizers are not subject to these constraints or concerns because they do not depend on air quality and also do not consume water.

- Vertiv agrees with the statement in the Comment that, "[a]chieving full refrigerant economizer conditions at higher outdoor temperatures can be achieved by increasing the equipment sizing capacity at design conditions," and "[i]ncreasing the available heat rejection capacity allows pumped refrigerant economizers to operate in full economizing mode at higher outdoor dry-bulb temperatures, thereby reducing energy use." However, Vertiv believes it important to consider that there are real design, cost, and space consequences for such design changes. For example, TN #238317 explains that data center owners would need to install "excess units" or "oversized equipment" only to meet this elevated economizer temperature rather than deliver any other benefit to the owner/operator.

For the reasons set out above, Vertiv believes that Comment #238233 includes incomplete and flawed analysis, and respectfully requests that the Commission take these shortcomings into account. Additionally, Vertiv believes that this Comment's proposed addition of a table of "Minimum Pumped Refrigerant Economizer CRAC Net Sensible COP by Climate Zone" is inappropriate, inconsistent with the Commission's submeasure proposal process, and should not be considered.

Vertiv respectfully requests that the Commission accept the current draft language as it is written in the Express Terms.