**Minimum Airflow Fractions for Ultra-High Efficiency RTUs in the Multiple Capacity Large Unitary Workpaper (SWHC043-01)**

PG&E and Energy Solutions

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Introduction

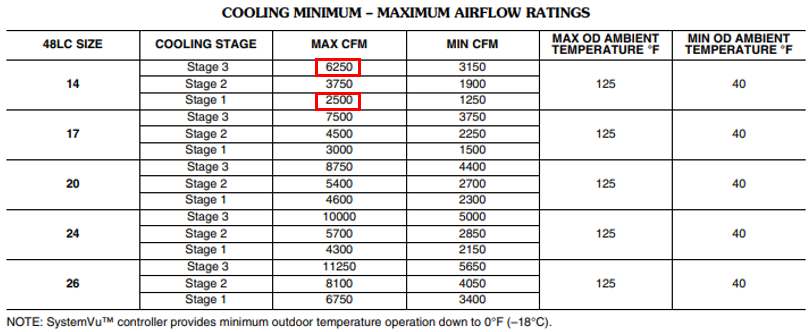
This document shows, through several publicly available resources, how PG&E selected the minimum airflow fraction of 0.40 to represent “ventilation-only” mode for RTU energy modeling in the MCLU workpaper.

DOE RTU Challenge Spec

Our measures are intended to replicate the high energy efficiency performance of RTUs that meet the DOE RTU challenge from 2012. The RTU challenge stated in its specification that supply fans must have a separate ventilation-only mode in addition to cooling and heating modes.[[1]](#footnote-1) This mode is intended to save fan energy during low-load operating hours.

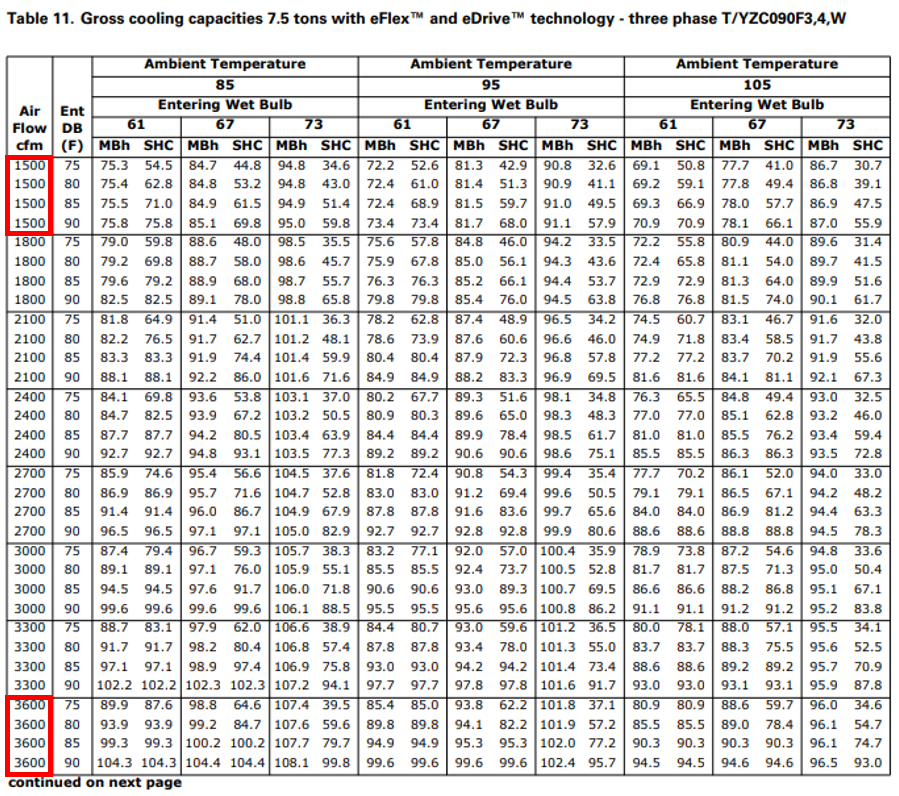
Carrier

An example in Carrier literature shows how the 0.40 fraction was chosen. Carrier engineers instructed that this value is calculated by taking the ratio of the maximum airflow in stage 1 to the maximum airflow in stage 3. A screenshot from the product literature shows the two values used, with 2500 cfm/6250 cfm=0.40.[[2]](#footnote-2) Note that unit sizes “24” and above are outside of the scope of this workpaper (which caps at <20 tons).



Trane

The supply fans for Trane equipment (with eFlex variable speed compressors and eDrive variable speed supply fans) are shown in the product literature to go down to 5/12 (1500 cfm/3600 cfm in the example below) of full airflow, or approximately 0.417.[[3]](#footnote-3)



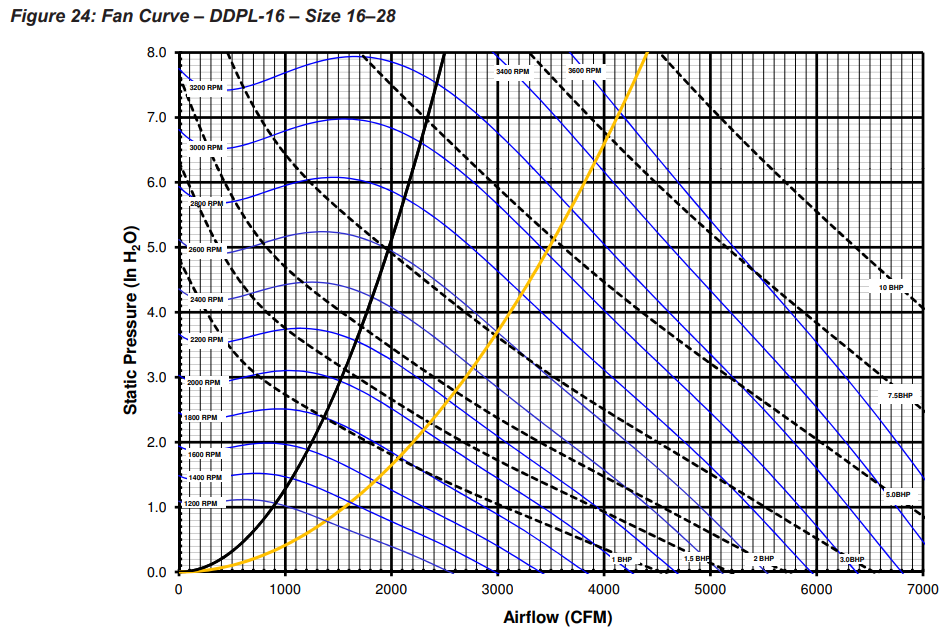
Lennox

In publicly available documentation, Lennox has stated that its “multi-stage air volume” (MSAV) units can reduce airflow down to 0.35 of full airflow.[[4]](#footnote-4) Lennox Energence Ultra-High Efficiency RTUs between 5.4 and 20 tons use MSAV supply fans.[[5]](#footnote-5)

Daikin

Daikin Rebel RTU supply fans are fully variable and their minimum speed is governed by avoiding the fan’s surge region.[[6]](#footnote-6) The specific minimum airflow fractions will depend on the RTU’s system curve, which is influenced by the total static pressure loss inside the unit (internal static pressure) and building ductwork (external static pressure).

An example is shown in the Rebel product literature. The image shows the different fan speeds in rpm (blue lines) as well as an intersecting system curve in yellow. Taking the minimum to maximum ratio (1400 cfm/4150 cfm) yields 0.337.



Summary

All advanced, ultra-high IEER RTUs that meet the DOE RTU Challenge can operate their supply fans at a reduced speed when in ventilation mode. The workpaper uses a value of 0.40 to represent a middle ground across multiple manufacturers and equipment sizes.

1. <https://www1.eere.energy.gov/buildings/publications/pdfs/alliances/cbea_rtu_spec_long.pdf>. [↑](#footnote-ref-1)
2. <https://www.shareddocs.com/hvac/docs/1005/Public/0D/48LC-14-26-05PD.pdf>. [↑](#footnote-ref-2)
3. <https://www.trane.com/content/dam/Trane/Commercial/global/products-systems/equipment/unitary/rooftop-systems/precedent-3-to-5-tons-eflex/RT-PRC053F-EN_01142019.pdf> [↑](#footnote-ref-3)
4. <http://tech.lennoxintl.com/C03e7o14l/VIu12Ch2uV/485101_0806.pdf> [↑](#footnote-ref-4)
5. <http://tech.lennoxintl.com/C03e7o14l/VIu12Ch2uV/ehb_lgh_bbox_ultra_1702.pdf>. [↑](#footnote-ref-5)
6. <https://oslo.daikinapplied.com/api/sharepoint/GetDocument/Doc100/Rebel%20Comm%20HC%203-28Tn%20Catalog%20CAT_256.pdf> [↑](#footnote-ref-6)