

Climate solutions in indoor environmental systems: *An avoided emissions case study*

Power electronics & drives manufacturer Danfoss is reducing the energy consumption of heating, ventilation, air conditioning and refrigeration (HVAC/R)

→ ~3.7% lower energy consumption

with Danfoss variable speed drive installed compared to the average HVAC system in North America



Source: Danfoss

Up to 614 kt CO₂ eq.

avoided in 2024 through the use of Danfoss drives in HVAC/R applications in North America.

Capturing avoided emissions

— assessment details

- **Functional unit:** Provision of heating, ventilation or air conditioning for a defined building zone meeting a specified indoor temperature setpoint.
- **Impact:**
 - New demand: 15.2 t CO₂eq. / VFD sold.
 - Improvement: 87.4 t CO₂eq. / VFD sold.
- **Time period:** Forward-looking on the reference service life (7, 10 or 15 years, depending on the product) of the AC drives sold in 2024.
- **Scope:** HVAC/R applications in North America.
- **System boundaries:** Use phase emissions of the HVAC/R. The drive's production and transport emissions only have to be taken into account in the "no drive" reference scenarios, and in these cases, they are negligible (< 0.5%) compared to the drive's emissions savings.

Use this document to support your understanding of real-life avoided emissions use cases. Learn more in the WBCSD Guidance on Avoided Emissions, available at:



The reference scenario

There are three reference scenarios:

- **New demand:** a newly built HVAC/R system operates with a market-average drive.
- **Improvement:** an existing HVAC/R system operates either without a drive (the fixed-speed motor fan runs at full capacity regardless of the actual demand), or equipped with an older, less efficient drive.
- **Replacement:** a new drive replaces an equivalent one.
- Danfoss has based their calculations on the assumption that the system in each reference scenario continues operating without additional upgrades over the assessment period. They recognize that this simplification may lead to an overestimation of avoided emissions.
- Emissions are based on electricity consumption during operation, using North American grid emission factors.

The low-carbon scenario

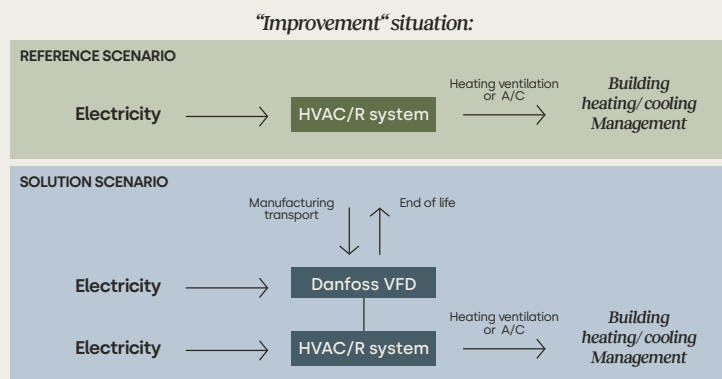
- HVAC/R systems with Danfoss's variable frequency drives (VFDs) adjust the fan speed based on demand. This reduces electricity use while delivering the same ventilation.
- Energy savings depend on the application type. New demand: up to 2%; improvement: up to 40%.
- The replacement scenario has no avoided emissions claim.
- Avoided emissions are calculated from electricity savings over the equipment lifetime, operating hours and sales volumes, regional grid emission factors and projected electricity decarbonization.



Source: Danfoss

How it works

System boundaries



The solution reduces the Scope 2 (HVAC power consumption) of building operators.

WBCSD Avoided Emissions Eligibility Gates

- Gate 1: Climate Action Credibility
- Gate 2: Climate Science Alignment
- Gate 3: Contribution Legitimacy

What share of Danfoss's revenue does this solution represent?

'Power Electronics & Drives' (which includes VFDs) accounted for approximately 25% of Danfoss Group revenues in 2024.

Environmental and social side effects

The solution could prompt early replacement of existing equipment, the use of additional auxiliary equipment, or non-optimal installation. Danfoss may evolve their methodology to reflect these effects.

Third-party verification

FORCE Technology Denmark verified the methodology described in this document in 2024.