

United Technologies Research Center

Project Title: High Efficiency High Speed HVAC Drive

Objectives: To develop a WBG based high-efficiency high-speed HVAC drive for a newly developed low GWP (Global Warming Potential) compressor

Major Milestones: TRL 5 Demonstration of the proposed WBG base stacked multilevel converter running a high speed compressor system.

Significant Equipment Acquisition: None

Deliverables: Technical reviews and reports

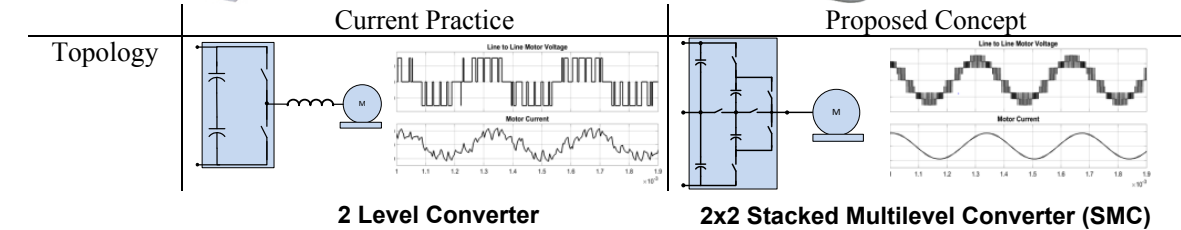
High Speed Drive for Low GWP HVAC Systems



Light Commercial
(5 to 25 tons)



Residential
(1.5 to 5 tons)



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WBG Technology Impact

1. Market segments impacted. Application Spaces: Motor drives, Inverters, converters for aerospace.
2. Timeframe for commercialization: Field trial TRL 8 demonstration in 2020-21 followed by initial customer installations by 2022.
3. Advances over silicon, or conventional approaches.

	Silicon IGBT	Proposed Concept
Efficiency	92%	≥98%
Drive Volume	9 liters	2 liters
Inductor Volume	1 liter	0 liter
Weight	10 kg	2.5 kg
$I_{\text{motor THD}}$	37%	≤ 8 %
dv/dt	≤ 5 kV/μs with inductor	≤ 5 kV/μs without inductor

Additional impacts

1. Advance manufacturing process that will enable cost-competitive, large scale production of WBG semiconductor-based power electronics
2. Energy savings due to the large energy impact in HVAC applications that accounts for nearly 40 percent of total U.S. energy use
4. Specify TRL level

At project start: TRL 3

Expected at project completion: TRL 5

This page contains no technical data subject to the EAR or the ITAR.