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Field Validation of VRF System Performance in Cold-Climates

David Lis / Northeast Energy Efficiency Partnership

Technology Summary

Variable refrigerant flow (VRF) is an HVAC technology that can provide both heating and cooling. VRF systems circulate refrigerant as the heat transfer medium. VRF systems generally include one or more air-source outdoor compressor units serving multiple indoor fan coil refrigerant evaporator units. DC inverters are added to the compressor to support variable motor speed and thus variable refrigerant flow rather than simply perform on/off operation. Systems selected with a heat recovery module have the added benefit of simultaneously heating and cooling from one condensing unit, transferring energy between zones. "Cold-climate" VRF systems promise capacity and efficiency even at low temperature operation.

Project Objectives

- To generate and assess high quality observed in-field data on variable refrigerant flow (VRF) actual energy performance and refrigerant leakage.
- To effectively communicate these results to key audiences that directly impact heating, ventilation and air conditioning (HVAC) technology selection in commercial institutional and multifamily buildings (i.e., building engineers, large commercial building developers, state/local housing agencies, municipalities, program administrators, etc.)

Key Personnel

David Lis (NEEP), David Korn (Ridgeline Analytics), Greg Goodyear (Ridgeline Analytics), Chris Badger (VEIC), Donovan Gordon (NYSERDA), Christopher Dymond (NEEA), Peter McPhee (MassCEC), Keshmira McVey (BPA), Eric Dubin (Mitsubishi), Ben Hiller (Daikin)

Program Summary

Period of performance: 36 months

Federal funds: $500,000
Cost-share: $222,000
Total budget: $722,000

	Key Milestones & Deliverables
Year 1	• Confirm and convene Stakeholder Advisory Committee • Contract HVAC Engineering Firm • Develop in-field VRF refrigerant leakage measurement and energy efficiency measurement/analysis protocol • Confirm host sites for in-field measurement and complete energy modeling for each site
Year 2	• Collect VRF system energy performance data and refrigerant leakage in accordance with the pre-established protocols to confirm high quality data • Monthly confirmation that monitoring system is functioning correctly
Year 3	• Final report of analysis • Final report of results, implications and recommendations • Develop and initiate communication and dissemination plan

Technology Impact

According to a New York analysis, under its high growth scenario, VRF could achieve 2.7 TBtus of net total energy savings in New York by 2025. The Northwest Power and Conservation Council estimated potential savings for new and retrofit commercial VRF at approximately 1.2 billion kWh/yr.

To accelerate the adoption of market-ready, high efficiency Variable Refrigerant Flow (VRF) systems in commercial, institutional and multi-family buildings in cold climates

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