DR16.06: VRF Market Characterization for ADR Program Readiness

OPPORTUNITY

What is the potential for variable refrigerated flow system to participate in automated demand response?

Variable refrigerant flow (VRF) systems are well-suited for automated demand response (ADR) because of their higher efficiency, inherently flexible design, and zone based controls available from the factory.

TECHNOLOGY

How do variable refrigerant flow systems work?

VRF system architecture is comprised of an outdoor condensing unit connected to multiple evaporator fan coil units that are located inside the individual conditioned zones. The system can vary the amount of refrigerant flow to each zone. At this time, VRF systems can manually carry out demand reduction strategies, but do not have the capability to be automated.



Figure 1: Diagram of VRF System Structure

RESEARCH

How market-ready are VRF systems to participate in automated demand response?

EXISTING DR CAPABILITY

Add-on manual DR options include:

- Remote setpoint control
- Automated setpoint setback
- Turning off units in rotation
- Limiting compressor demand
- Zone differentiation
- Power meter reading
- Snapback control

CODE COMPLIANCE

VRF required to comply with the Title 24 Automated Demand Shed Control measure, but not the Occupant Controlled Smart Thermostat measure.

VRF systems can contribute to the ASHRAE 189.1-2014 10% peak demand reduction.

ADR EXECUTION OPTIONS

Options available to VRF manufacturers to add ADR:

- Use a central controller with a built-in OpenADRcertified Virtual End Node;
- Employ a second OpenADR certified VEN;
- Send the ADR signal to the Energy Management Control System (EMCS) (if the VRF system is connected to the building EMCS).

CONCLUSIONS AND RECOMMENDATIONS

What steps forward does this report recommend for SCE?

Market Signals Needed

VRF systems do not currently have the capability to participate in ADR, though much untapped potential exists in the market. First, SCE should confirm the manufacturers' claims of readiness of VRF systems for implementing ADR in a lab setting. Once confirmed, SCE should motivate VRF manufacturers to develop and commercialize ADR-capable controls through utility engagement and outreach. Finally, SCE can signal market demand for ADR-capable VRFs by offering specific VRF ADR incentives to manufacturers, distributers and customers.