

DR18.11 ADR Capabilities of VRF Technologies Manufacturer Outreach

OVERVIEW

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

A 2017 market characterization study of ADR capabilities of VRF technologies that informed this outreach strategy found that the control functions of these systems can manually carry out demand reduction strategies but are not sufficiently integrated to perform ADR. The study found that this was because many VRF manufacturers were waiting on client and utility demand for ADR features. VRF manufacturers were generally interested in utility incentive programs but were not familiar with the specific requirements in both the current Title 24 requirements and ADR program requirements.

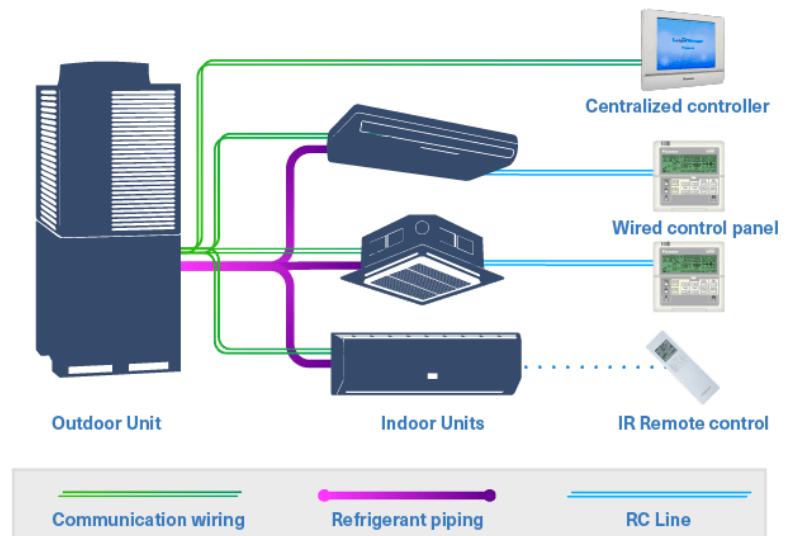


Figure 1: Diagram of VRF system structure

Did You Know? California's Title 24 Building Energy Efficiency Standards for Residential and Non-Residential Buildings outlays requirements for ADR in sections 100.1, 110.12, 110.2. Title 24 language does not make the distinction between cloud or non-cloud virtual end node (VEN). However, out of the two options to comply with the OpenADR certified VEN requirement, only one allows for a cloud VEN.

ADR ENABLEMENT AND VRF CONTROLS WORKSHOP

Southern California Edison (SCE) conducted outreach to VRF equipment manufacturers to arrive at an understanding on SCE's OpenADR product requirements and demand response (DR) participation needs. Outreach included a webinar, one-on-one calls with two equipment manufacturers, a working group call, and culminated in an in-person workshop conducted on November 2019 at SCE's Energy Education Center.

This ADR Enablement of VRF Controls Workshop was attended by 23 people representing six VRF manufacturers including: Daikin, LG, Mitsubishi, Samsung, Johnson Controls-Hitachi, and Carrier-Toshiba. The goal of this workshop was to:

- Review regulatory, policy, and program context for demand response in California and how VRF systems fit in
- Review Title 24 and SCE ADR Program baseline requirements
- Agree on a common set of solutions for making VRF systems ADR-capable out-of-the-box for small and medium business (SMB) customers who don't have the resources to spend on custom programming
- Provide information needed to move forward on agreed solutions.



Image 1: SCE's Energy Education Center

The VRF workshop involved presentations in the morning with working sessions in the afternoon. The morning presentations set the stage for why manufacturers should care about developing out-of-the-box controls for load management. The afternoon was a working session that took a deep dive into specific topics on ADR applications for VRF controls including identifying and comparing virtual end node (VEN) solutions for VRF systems and on default DR control strategies that could be executed by VRF systems for a DR event.

MAJOR FINDINGS AND KEY TAKEAWAYS

A consistent theme throughout the VRF workshop was that manufacturers needed more guidance from utilities on OpenADR signals. This includes guidance on when and how often OpenADR signals would be set, which customers would receive these signals, and the event details contained in the signal.

In order to accomplish this, VRF manufacturers recommended that utilities form a group to develop a common way to signal for DR events. This standardized approach would be used by all manufacturers to develop common (default) control strategies that met the load shed objectives of utility DR programs.

During the breakout sessions, SCE proposed that a 24-hourly day ahead pricing signal, which is currently used for the SCE Real Time Pricing (RTP) DR program, could be useful for VRF manufacturers. Manufacturers agreed that this type of pricing signal, coupled with a load dispatch indicator (e.g. % load reduction), would be sufficient data to develop optimized DR control strategies. These types of signals would require utilities to leverage OpenADR 2.0b and for manufacturers to integrate or work with OpenADR 2.0b VEN devices.

During the closing statements of the VRF workshop, SCE indicated interest in incorporating manufacturer feedback in the design of future DR programs. From the workshop, it was clear that manufacturer input would help utilities in developing DR programs that could fully leverage DR-enabled technologies. For example, with simple, pricing, and load dispatch signals, VRF manufacturers would be able to develop DR solutions that optimized both load shed and customer quality of service.

THE BOTTOM LINE

SCE conducted a workshop to communicate key information surrounding ADR as well as gain a better understanding of the needs of VRF manufacturers. The workshop found that manufacturers need more guidance from utilities surrounding ADR signaling. As a path forward, SCE offered to provide price signaling in advance so that manufacturers could optimize their DR strategies.

Next steps include follow up meetings between SCE and the VRF manufacturers. Utilities will develop clearer and more specific guidance on OpenADR signals as well as frame the discussion around customer needs to allow manufacturers to push the changes within their own companies. Additionally, SCE is exploring conducting similar outreach to other technologies such as HVAC controls more broadly, energy storage, electric vehicle charging, or smart inverters.

These Findings are based on the report "ADR Capabilities of VRF Technologies Manufacturer Outreach," which is available on the Demand Response Emerging Technologies website: <https://www.dret-ca.com/>