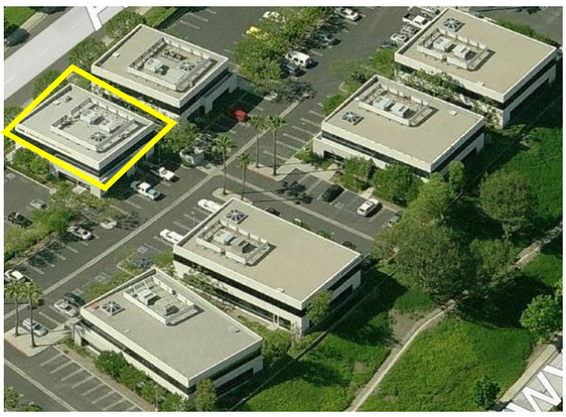
DR12.16 Testing of Commercial Variable Capacity Heat Pump (VCHP) for Small Commercial Office Buildings

INTRODUCTION

In addition to energy efficiency, demand response is another important aspect of a load that is of interest to the utilities. HVAC systems are coincident load on the electric system. Reduction in demand imposed by HVAC systems during these peak hours will help the electric utilities economically and reliably serve the loads during these hours.

To understand the energy efficiency and demand response capabilities of a Variable Refrigerant Flow (VRF) system in the field, a 24-ton, 17 zone VRF-HR (heat recovery) system was installed and monitored in Southern California. The project had the following objectives:

- Collect operational performance data on an installed VRF-HR system
- Assess the ability of installed system to respond to OpenADR signals as a resource for demand response



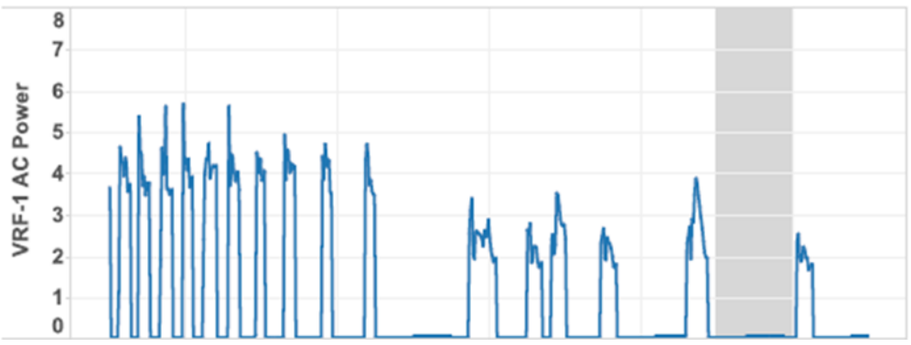
Project site in Mission Viejo, California

DATA ANALYSIS

Data representing thermal and electrical characteristics of the VRF system was collected from the site for a period of 12 months – from April 2014 to March 2015. The electrical characteristics were used to determine the energy used, load profile, and demand imposed by the system on the grid.

DEMAND RESPONSE

Demand response capabilities of the VRF system were demonstrated using OpenADR 2.0a messages sent from a Virtual Top Node (VTN) setup at EPRI. An additional controller setup on-site acted as an OpenADR Virtual End Node (VEN) and translated the OpenADR commands to native machine language for the VRF system.



This figure shows the demand from the first floor during the DR event. The grey area shows the VRF system follows the DR signal very well with no demand imposed during the specified time.

CONCLUSIONS

The monitoring and analysis of the VRF-HR system shows that the operating characteristics were in line with the expectations based on understanding of HVAC systems. Summary of the findings and discussion is presented below:

- The high demand during summer peak hours makes the VRF installation a potential candidate for the Demand Response program.
- Demand reduction via the OpenADR messaging was demonstrated by the system responding to a pre-scheduled Demand Response event.