

# DR16.05: Laboratory Assessment of Demand Response RTU Controller

## OPPORTUNITY

California commercial cooling relies heavily on Rooftop Unit (RTU) A/C support. Can Automated Demand Response Controllers help reduce demand peaks from A/C?

A large percentage of the A/Cs found in California’s small- or light-commercial sector are packaged RTUs, with cooling capacities ranging between 5 and 10 tons. This laboratory assessment considers placing Automated Demand Response, ADR, controls on a 5 ton RTU to establish power reduction potentials for this large segment of the commercial cooling market equipment.

## TECHNOLOGY

How does automated demand response in data centers work?

RTU equipped with ADR controller and variable frequency drive (VFD). The VFD changes the speed of the compressor and supply fan. The ADR controller provides operational strategies for cycling the speed of the unit during the DR event.

Figure 1: 5-TON RTU fitted with: VFD Controller (left) and ADR Controller (right)



## M&V

What were the testing conditions and parameters for the laboratory testing?

The project compared the performance of the RTU under controlled laboratory conditions at SCE’s Technology Test Center (TTC). Testing included multiple conditions for space and outside air temperatures. It also considered two sets of demand reduction strategies. Each altered the operation of the RTU fans and A/C compressor. The first was a Moderate Strategy which reduced the VFD frequency by 33%. A second more aggressive, High Strategy, reduced the VFD frequency by 33% and cycled the unit on and off every 6 minutes each 15-minutes for 1-hour.

SCENARIOS	OUTDOOR TEMPERATURE	DR STRATEGY TYPE
Space Temperature of 75 °F	95 °F	Moderate / High
	105 °F	Moderate / High
Space Temperature of 80 °F	95 °F	Moderate / High
	105 °F	Moderate / High

## RESULTS

What were the impacts of ADR on the power and space temperature?

**20% to 33%**  
Reduction for the average total power demand for the Moderate DR strategy.

**60%**  
Reduction for the average total power for High DR strategy.

**TEMPERATURE**  
Space temperature increased between 6 °F and 9 °F for the Moderate DR strategy and between 14 °F and 17 °F for the High DR strategy.

## RECOMMENDATIONS

What considerations should utility DR Programs make for commercial RTUs?

### Automated DR for Commercial RTUs

Gathered data suggests there is a potential to reduce RTU power demand using Automated DR-capable controllers. The potential to reduce power demand was more noticeable for High DR event scenarios compared to Moderate DR strategies.

Given the large potential for power reduction and the abundance of RTUs in the market the study might suggest incorporating DR as a standard control feature. Future studies may consider evaluating similar technologies and perhaps new DR scenarios.