SCE DRET Findings
APRIL 2016

DR13.07: HVAC & Refrigeration Systems Using Advanced Refrigerants

OPPORTUNITY

What have previous studies demonstrated about the potential for advanced refrigeration systems?

16%-25% ENERGY SAVINGS

Field testing demonstrated 200-300 kWh per day savings potential vs. the baseline (current practice) system. Demand response impacts are feasible under certain operating conditions with advance notice, however additional control and automation will be needed to adjust CO2 pressure and allow for additional pre-cooling opportunities.

TECHNOLOGY

How do advanced refrigeration systems work?

The advanced refrigerant system uses ammonia as the primary fluid, then CO2 as a pumped secondary fluid that is distributed into the building.

M&V

Where did Measurement and Verification occur?

M&V took place via laboratory evaluation of a select system and then field testing at multiple sites in SCE's service territory. Field tests used advanced refrigerants for commercial and small industrial applications.

RESULTS

How did advanced refrigerant systems perform in M&V?

During hotter weather in summer, the savings of the new system under similar operating conditions vs. baseline equipment was 16-25%.[1]

The average power for the new equipment was 14-21 kW lower during the first hour of simulated DR events vs. baseline equipment.

DEPLOYMENT

Where does M&V recommend deploying advanced refrigerant systems?

Control Capability

Further research efforts should evaluate the ability and effect for adjusting the CO_2 pressure. Since supply temperature is limited by this pressure, having the ability to adjust it should allow for pre-cooling and thus additional energy savings.

Future DR performance for advanced refrigerant systems will likely improve with increased control capability and automation. As equipment becomes more commercialized, the industry should be encouraged to assess future DR program feasibility and participation.

[1] *Ammonia/CO_2 Refrigeration System Evaluation at a Food Processing Facility, Emerging Products, April 2017, p.18*