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Presented by



Residential Ducted Split System Variable Capacity Heat Pumps (VCHP)



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Residential Ducted Split System Variable Capacity Heat Pumps (VCHP)



- **Variable capacity heat pump (VCHP) uses**
 - a variable or modulating compressor
 - designed specifically to provide a broad range of capacity output needed (40% to 100%)
 - at the lowest consumption of power
- **Replaces**
 - Standard single or fixed speed ducted split systems with indoor furnace and outdoor compressor
- **Advantages over Fixed Speed Systems**
 - Meets heating and cooling loads at reduced air flow and compressor speeds
 - Offers higher heating output at lower outdoor temperature
 - Is a Grid Responsive/Building Electrification Solution
 - Eliminates auxiliary heating devices (backup resistance strip heating)
 - Uses less energy

SDGE's 2016 Field Performance Study (EPRI)

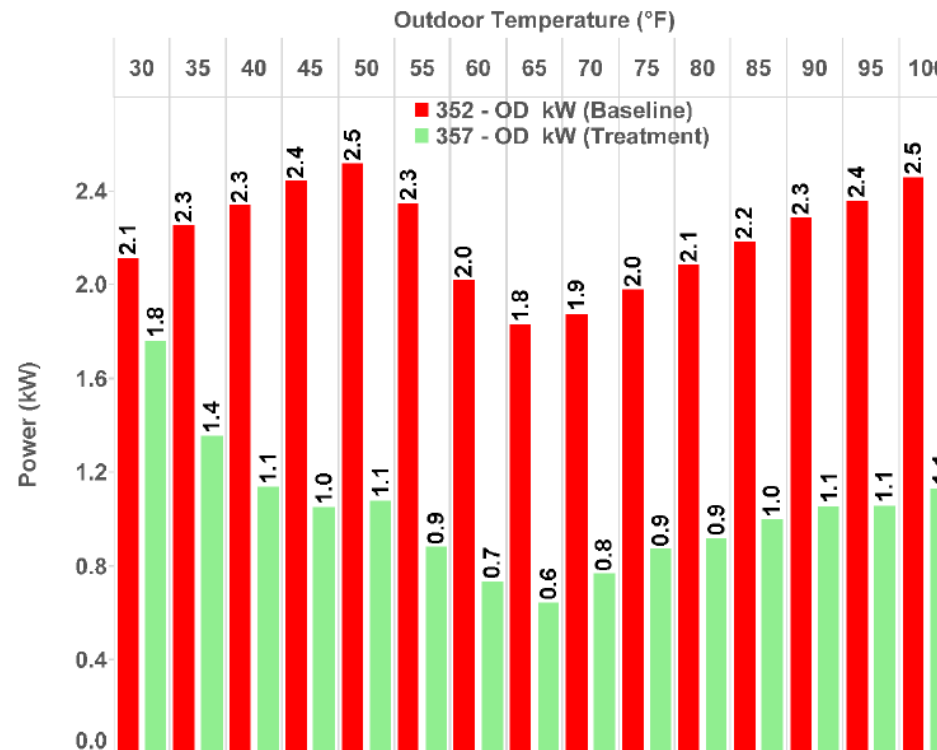


Figure 4-5
Outdoor power comparison for outside Condos 352 and 357

Approximately **30%** peak demand reduction

Central Valley Research Homes (CVRH) Field Study (2014-2018)

○ **Project Background**

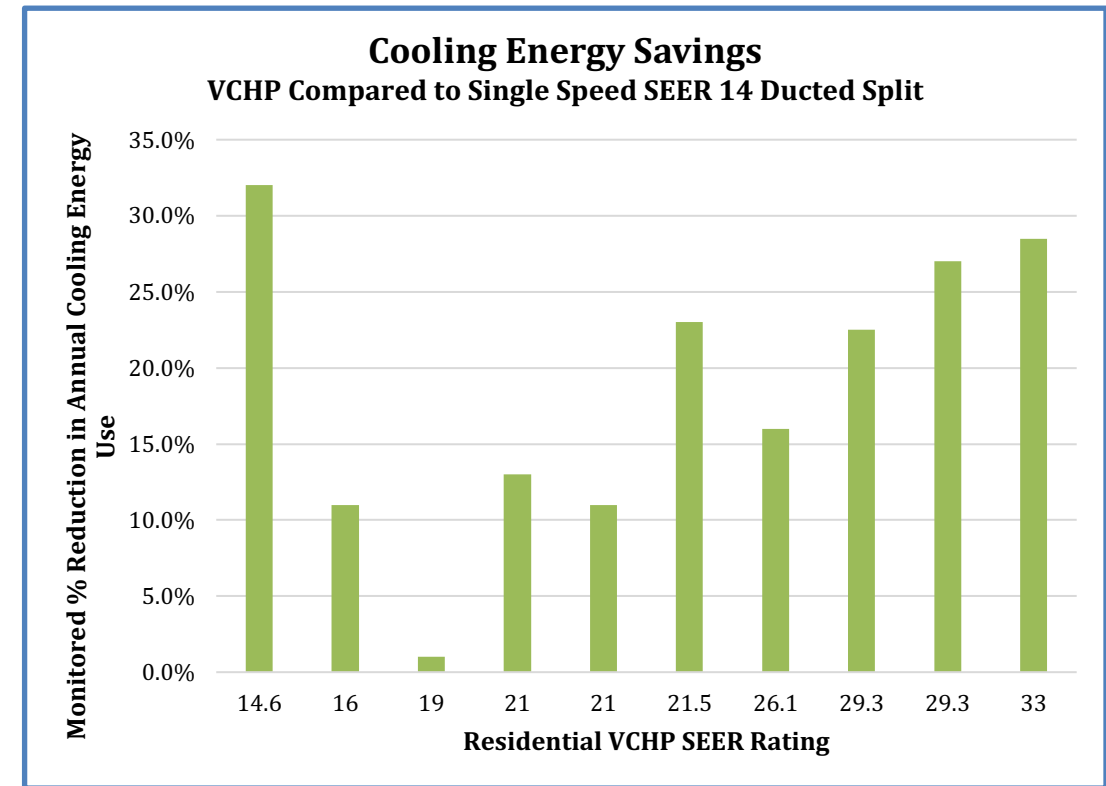
- Co-funded the field test assessment effort resulting in energy model code compliance credits (5% cooling and 12% heating credit)

○ **Key Findings**

- Ducted VCHP comfort zone similar to centrally ducted single-speed unit
- SEER and HSPF efficiency ratings do not reliably predict the energy performance
- Poorly understood installation and design sizing practices

Market Barriers

1. Misalignment between AHRI Test Method Efficiency Ratings versus field performance predictions
 - (proprietary algorithms)
2. Standardized test methods not yet available (CSE EXP07:19)
3. Incentive programs constrained by regulatory framework
4. Timing of code compliant software updates due to performance uncertainties
5. Right sizing practices (oversizing)



Market Transformation Recommendations

1. Establish Standardized Testing in Real World Environments for VCHP Performance
 - Near-term solution: CSA EXP07:19
2. Update VCHP Code Compliant Software
3. Determine Full Load Conditions and Different Baselines Requirements
 - VCHP benefits when the system operate at part load
4. Perform Additional Lab and Field Tests to Progress Current Compliance Credit
 - 5% cooling and 12% heating efficiency credit for installing VCHPs
5. Uncover Proprietary Control Strategies to Improve and Predict Efficiency Better
6. Promote and Educate on Right Sizing Best Practices



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