Evaluating the Benefits across the U.S. of Variable-Speed Equipment for Packaged Rooftop Units (RTUs)

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Objective:

- Perform economic assessments of variable-speed equipment applied to RTUs for different building types and locations

Background/Motivation

- Small RTUs typically employ a single-stage compressor with fixed-speed fans
- Significant savings opportunities for retrofitting existing RTUs with variable-speed supply fans
- Significant variable-speed offerings for residential

Expected Results / Impact:

- Target the most appropriate applications (building types and locations) for different variable-speed options
- Provide information that can be used to promote this technology

Approach:

- Modify existing tool that for small commercial buildings to include variable-speed supply fans, compressors, and condenser fans
- Estimate equip. & utility costs for economic analysis
- Perform simulations across climates & buildings Evaluate economic impacts for different variable-speed options: 1) supply fan retrofit, 2) RTU retrofit with variable-speed supply, 3) RTU retrofit with all variable-speed equipment

Schedule:

Months:	1-4	5-8	9-12
Modify existing model			
Estimate costs for economic analysis			
Perform simulations across various climates and buildings			
Provide summary results for economic impacts for different variable-speed options			

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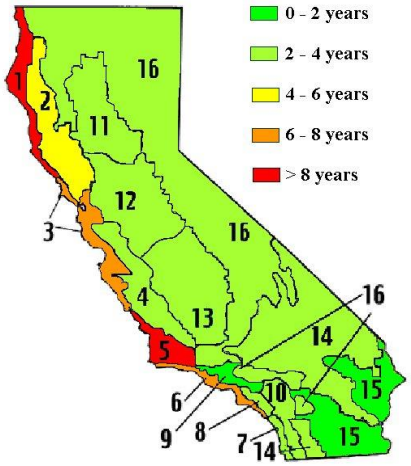
Center for High Performance Buildings at Purdue

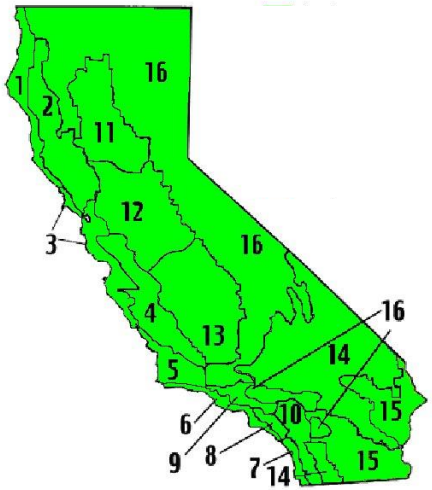
Sample Economic Payback Periods (years) for Demand-Controlled Ventilation

California Results

Office



Retail Store



- Purdue has previously developed simulation tools and prototypical buildings for assessing the benefits of various demand-controlled ventilation and other strategies for small commercial buildings
- These models will be extended to consider retrofits of variable-speed equipment

National Results

Location	Office	Restaurant	Retail Store	School
CACZ03	6.8	2.1	1.0	4.0
CACZ15	1.9	0.6	0.3	0.9
Phoenix	3.4	0.9	0.6	1.5
Charleston	1.1	0.7	0.4	0.9
Fargo	1.5	0.3	0.2	0.5