



# CENTRAL VALLEY RESEARCH HOMES Project

## PROJECT OVERVIEW—MAY 2013

## TYPICAL CONDITIONS IN OLDER HOMES ▾

### Problem Statement

California's stock of existing homes offers cost effective opportunities for significant efficiency upgrades. Because of the large number of existing homes, the total opportunity for savings is many times larger than can be expected from new homes built to meet the state's current Residential Building Energy Efficiency Standards.

However, current energy calculation tools have an abysmal record at estimating the energy use and energy efficiency of older homes, especially when monitored data is complicated by the presence and behavior of occupants. In addition, the development of HERS procedures has been hampered for years by lack of data to validate energy calculations in older homes. To date, there has been no facility that provides the opportunity to collect detailed data under controlled conditions in older California homes. The Central Valley Home Research Project is changing that.

### Project Goals

Acquire and maintain four unoccupied homes in Stockton, California to serve as laboratories where energy use and energy efficiency can be scientifically studied and the results applied to:

- » Improving calculation methods and HERS II ratings
- » Developing analytical approaches and optimized packages of upgrade measures for typical existing homes
- » Informing local and statewide energy efficiency programs
- » Providing a test facility for emerging retrofit technologies



Single glazed aluminum sliders



Minimal ceiling insulation, no wall or raised floor insulation, poor duct system in attic



Outdated roof systems

### PROJECT PARTNERS

- Cardinal Glass Industries
- 3M
- Green Home Solutions by Grupe
- California Energy Commission PIER Buildings Program

### RESEARCH TEAM

- Bruce Wilcox, PE
- John Proctor, Proctor Engineering Group
- Rick Chitwood, Chitwood Energy Management

## The CVRH Project is finding answers to these questions:

How much energy and demand is actually saved by these upgrades and how do these upgrades interact?

- » Installing new high performance windows
- » Replacing ducts and grilles, or sealing and insulating ducts
- » Adding attic, wall and floor insulation
- » Air sealing
- » Replacing or upgrading HVAC systems
- » AC downsizing

How reliable are the HERS Raters results and how accurate is the HERS II software? How can we give homeowners and retrofit program managers more confidence to proceed with home efficiency upgrades?

## Project Activities & Timeline

### 2011: Home Acquisitions

Project team rents four typical, unoccupied homes of different vintages in Stockton, California (see sidebar, right).

### 2012: Conduct HERs Ratings and Install Instrumentation

Project researchers carry out a complete survey and full suite of diagnostic tests to characterize and document the homes' energy features. Multiple HERS researchers are hired to rate each home, and their results compared to each other and to the team's measurements. Instrumentation, reference HVAC systems, and Cardinal-provided monitoring and control systems are installed in each home.

### 2012–2013: Collect As-Found Performance Data

All four houses are operated with as-found energy features for one year to generate a baseline hourly data set. The as-is and reference HVAC systems are run alternately. HERS II estimates are compared to measured data and the results used to develop input rules and simulation algorithms to improve the accuracy of HERS II estimates.

### 2013–2014: Install First Upgrade Packages and Collect Data

Envelope (insulation, windows, air sealing, cool roof) and HVAC (whole house fans, ducts, fan motors, optimized controls, high AFUE and EER) upgrade packages are installed in each home. Cardinal contributes advanced retrofit glazing systems, an HVAC manufacturer contributes an advanced multi-zone ductless air conditioning system and 3M contributes a cool roof system for testing. Measured performance of the efficiency upgrades is compared with the HERS II estimates. Input rules and simulation algorithms are developed to improve the accuracy of HERS estimates of envelope and HVAC efficiency upgrades.

### 2014–2015: Install Second Upgrade Packages and Collect Data

Alternative glazing systems, additional high performance HVAC systems and other measures are installed and tested to determine their impact on energy use and peak demand.

## THE RESEARCH HOMES—STOCKTON, CA ▼



### ▲ Grange

Built 1948, 2 BR, 852 ft<sup>2</sup>, slab on grade



### ▲ Mayfair

Built 1953, 3 BR, 1104 ft<sup>2</sup>, crawl space



### ▲ Fidelia

Built 1996, 4 BR, 1690 ft<sup>2</sup>, slab on grade



### ▲ Caleb

Built 2005, 4 BR, 2076 ft<sup>2</sup>, concrete tile roof

For more information, contact the project's prime contractor:  
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