

# Mutual Housing California

Mutual Housing at  
Spring Lake  
Woodland, CA



## BUILDER PROFILE

Mutual Housing, Sacramento, CA  
Vanessa Guerra  
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Rater: Davis Energy Group  
David Springer, springer@davisenergy.com  
Builder: Sunseri Construction

## FEATURED HOME/DEVELOPMENT:

### Project Data:

- Name: Mutual Housing at Spring Lake
- Location: Woodland, CA
- Layout: 1-4 bedrooms, 1-2 baths (two 3-story apartment buildings and four 2-story townhome buildings)
- Conditioned Space: 709 to 1,515 ft<sup>2</sup> (64,604 ft<sup>2</sup> total)
- Climate Zone: IECC 3B, hot-dry
- Completion: March 2015
- Category: Multifamily

### Modeled Performance Data:

- HERS Index: 35% above CA Title 24-2008
- Projected Annual Utility Costs: without PV \$59,635, with PV \$8,581
- Projected Annual Energy Cost Savings (compared to a home built to CA Title 24-2008) without PV \$6,962, with PV \$58,016
- Builder's Added Cost Over CA Title 24-2008: without PV \$511,327, with PV \$1,197,859
- Annual Energy Savings: without PV 45,439 kWh, with PV 379,654 kWh

When Mutual Housing at Spring Lake opened its doors in March 2015, the 62-unit apartment development became the first multifamily affordable rental development in the nation to receive the U.S. Department of Energy's Zero Energy Ready Home certification.

The development, located in Woodland, California, performs at net zero energy, producing as much energy as it uses on an annual basis through the integration of energy-efficient design and solar energy generation. The six buildings that comprise Mutual Housing at Spring Lake are expected to save 36% to 40% over buildings built to the California's Title 24-2008 energy code. They are also expected to see a reduction of 40% in water use and related costs.

The built-in energy efficiency and rooftop photovoltaic system are expected to cut utility costs by \$58,000 per year for the development of 50 one-level apartments and 12 two-story townhomes at Spring Lake. The incremental costs for the solar arrays and additional energy were 9% above construction costs to just meet the 2008 Title 24 code, but Mutual Housing California, a nonprofit affordable housing developer, determined that the project should pay for itself quickly by qualifying for U.S. Department of Agriculture grants, low-income housing tax credits, and increased net rents as a result of lower utility allowances for the developments' occupants, who should have dramatically lower utility bills. While central California apartment dwellers typically pay \$94-\$227 per month in utility bills, residents at Spring Lakes are expected to pay less than \$12 and, in most months, no more than the \$5/month service fee.

The development will provide permanent housing for about 230 people, half of them children. The residents are all farm workers in the Sacramento Valley, according to Vanessa Guerra, a project manager with Mutual Housing California and herself a former farm worker. "Energy efficiency is very important to us



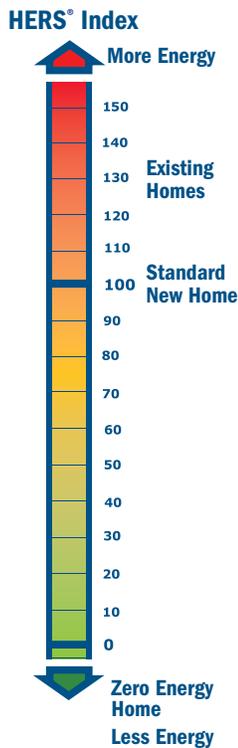
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.

Mutual Housing California’s community at Spring Lake in Woodland, California, is the first multifamily affordable rental development in the nation to receive the U.S. Department of Energy’s Zero Energy Ready Homes certification. The 62 apartments will house about 230 farm workers and children in super-efficient homes equipped with solar panels to offset nearly all of the residents’ utility bills. Landscaping choices, including native plants, pervious ground covers, deep watered fruit trees, and community gardens will cut irrigation needs in half. Community laundry facilities and water-saving plumbing fixtures will cut indoor water use by 40% or more.



### What makes a home a DOE ZERO ENERGY READY HOME?

- 1 **BASELINE ENERGY STAR Certified Homes Version 3.0**
- 2 **ENVELOPE** meets or exceeds 2012 IECC levels
- 3 **DUCT SYSTEM** located within the home’s thermal boundary
- 4 **WATER EFFICIENCY** meets or exceeds the EPA WaterSense Section 3.3 specs
- 5 **LIGHTING AND APPLIANCES** ENERGY STAR qualified
- 6 **INDOOR AIR QUALITY** meets or exceeds the EPA Indoor airPLUS Verification Checklist
- 7 **RENEWABLE READY** meets EPA Renewable Energy-Ready Home.



because the families we serve are low income; getting their utility costs down has a big impact on their day-to-day lives.”

“The DOE program was challenging for us the first time through, but we found it is a good tool because it really sets the guidelines for helping us achieve sustainability and resource efficiency. We appreciate the fact that it deals with both energy and water efficiency. We are dealing with rising water costs. The fact that the DOE program is such a well-rounded program that tackles all of those aspects of sustainable programs really appeals to us,” said Guerra, who has a degree in construction management and construction engineering from Sacramento State University.

This is the first DOE Zero Energy Ready Home project for Mutual Housing California, which was founded in 1988 and currently owns and operates 18 developments of subsidized multifamily housing for low-income families. According to Guerra the nonprofit is now adding about 150 units per year and typically works on two projects at a time, half rehabs of apartment buildings and half new construction.

Guerra noted that Mutual Housing has been interested in energy-efficient construction since 2002 when they developed the first multifamily project in Sacramento with roof-mounted PV. They decided to really pursue certifications for new projects in 2008 and began building to the state’s Build-It-Green program in 2010. The Spring Lake project is their first project labeled to ENERGY STAR and the EPA’s Indoor airPLUS certification. They are also seeking a LEED platinum certification on it.

“We will absolutely do more DOE Zero Energy Ready Home projects. Part of our mission is sustainable construction for all of our buildings, new and rehab. Now that we’ve done it at Spring Lake I think we can do it on all of our new construction. Rehab will be trickier but we will try to meet the specs there as well,” said Guerra.

The DOE Zero Energy Ready Home program requires homes to meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency’s Indoor airPLUS, as well as the hot water distribution requirements of the EPA’s WaterSense program and the insulation requirements of the 2012 International Energy Conservation Code. In addition, homes are required to have solar electric panels installed or have the conduit and electrical panel space in place for it.



All of the homes' lighting is high-efficiency ENERGY STAR-certified including screw-based LEDs and hard-wired compact and linear fluorescent fixtures. ENERGY STAR-certified refrigerators, dishwashers, and ceiling fans add to savings. A high-efficiency air-to-water heat pump provides space and water heating. ENERGY STAR exhaust fans provide ventilation. ENERGY STAR double-pane, vinyl-framed windows minimize heat gain.

The DOE Zero Energy Ready Home requirements start with a super-insulated building envelope as the basis for the energy efficiency. Exterior walls were framed using 2x6 studs spaced 16-inch on-center with high-density R-21 fiberglass batt insulation. Structural requirements precluded the use of 24-inch on-center stud spacing, but some advanced framing techniques such as open, insulated corners were included. In practice, batt insulation is typically more prone to defects such as voids and compressions than blown or foam insulation but the Home Energy Rating System (HERS) rater met with the project team and made regular site inspections during construction to encourage proper installation practices. The walls have OSB sheathing and house wrap under the fiber cement, stucco, and brick veneer siding. The foundation is an uninsulated slab on grade. In the hot California climate, it's considered best practice to leave the slab uninsulated allowing it to serve as a heat sink during the summer cooling season.

The buildings have vented attics with blown fiberglass insulation at the ceiling plane that achieved R-44 in the apartments and R-49 in the townhomes. The townhomes have raised heel trusses that were 18 inches high at the top plate to increase the depth of insulation along the perimeter. To meet the R-21 minimum established by ENERGY STAR on apartments, the builder installed 4-inch-thick pieces of rigid foam insulation placed between the trusses and extending two feet into the attic. A radiant barrier on the underside of the OSB roof sheathing reduces radiant heat transfer into the attics as do the Cool Roof Rating Council-certified roofing shingles, which have an initial solar reflectance of 0.26 and thermal emittance of 0.91.

The units were tested for airtightness and verified to meet the ZERH multi-family threshold of 4.0 ACH 50 (air changes per hour at 50 Pascals pressure difference). Average infiltration at the apartments was 2.3 ACH 50 while for the townhomes the average was just under 4.0 ACH 50. Although a moisture barrier was installed on exterior walls, no air barrier was installed at the party walls and the builder opted to utilize the interior drywall as the air barrier. Air sealing was completed in accordance with Section 5 of the ENERGY STAR Thermal Enclosure System Rater Checklist.

For heating and cooling, Mutual Housing selected air-to-water split-system heat pumps to provide space heating and cooling as well as water heating. Although somewhat more expensive than other heating and cooling options, these systems offer several advantages: the simplification of using a single system to serve

## HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

LEED for Homes, platinum level

Enterprise Green Communities

Build It GREEN GreenPoint Rated



Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE's Building America research program.



The air-to-water heat pumps provide efficient, combustion-free heating, cooling, and hot water.

all heating and cooling needs and the elimination of long refrigerant lines, natural gas piping, and combustion venting. The system offers space savings too; the split-system heat pump water heater has an outdoor evaporator so the inside unit is much smaller than typical heat pump water heaters. Each apartment has its own unit and hot water storage tank, eliminating losses from hot water recirculation piping. The inverter-driven variable-speed system has a rated system efficiency of 13 SEER for space cooling, 11 HSPF for space heating, and a 2.4 Energy Factor for water heating. The split system connects the outdoor unit to an indoor hydrobox that contains a refrigerant-to-water heat exchanger, pump, expansion tank, and other components typically required for hydronic systems. The heat exchangers are piped to fan coil units

installed in closets within each unit. These systems are ducted and the central air handler unit is located in a utility closet in the hallway.

In the apartments, the ductwork is located entirely within conditioned space. After drywall was installed and taped, hallway ceilings were furred down with steel framing and R-4.2 ducting was installed with very short ducts that supply sidewall registers in each of the rooms off the hallway. In the townhomes, the supply ductwork for the first floor is located between floors and for the second floor, it is in the attic. Attic ductwork is insulated to R-8 and is buried beneath at least 3.5 inches of blown fiberglass insulation. Leakage to the outside was tested and found to be much lower than the DOE Zero Energy Ready Home threshold for buried ducts of 3 CFM at 25 Pa per 100 ft<sup>2</sup> of conditioned floor area.

The solar electric system is owned by Mutual Housing California and is expected to offset 97% of estimated annual electricity use for the project. The system includes photovoltaic panels installed on the rooftops of the apartment buildings, the community center, and the parking lot carports for a total capacity of 209 kW DC, or 3.3 kW per unit, at a cost of \$11,000 per unit. The renters pay their utilities directly to the utility company. The utility keeps track of the PV credit and allocates the credit to each bill payer based on their apartment square footage.

Every apartment was equipped with a color-coded meter so residents could track their energy budget. The light changes from green to yellow to red then fuchsia as the household uses up the daily solar budget. If the resident stops when their daily use is in the red, they will have no monthly energy costs above a \$5 administrative fee for electricity. Mutual Housing also sponsors tenant education meetings and distributes green living guides.

*Photos courtesy of Mutual Housing California*

## KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** 2x4; 16" on center; fiberglass batts (R-21).
- **Roof:** Cool Roof Rating Council-certified composite shingles; 3' ice and water shield; waterproof underlayment.
- **Attic:** Vented; 18" raised heel trusses; blown-in fiberglass (R-44-49); rigid foam at some top plates.
- **Foundation:** Uninsulated slab on grade.
- **Windows:** Double-pane; argon filled; vinyl-framed; low-e; U=0.29; SHGC=0.19.
- **Air Sealing:** 2.3-4.0 ACH 50.
- **Ventilation:** Exhaust fans.
- **HVAC:** Air-to-water heat pumps; 13 SEER; 11 HSPF.
- **Hot Water:** Air-to-water heat pump.
- **Lighting:** 100% CFL and LED.
- **Appliances:** ENERGY STAR-rated refrigerator, clothes washer, and dishwasher.
- **Solar:** 209 kW (whole community).
- **Water Conservation:** Low-flow fixtures.
- **Other:** Energy management system; low-VOC.

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To test the effectiveness of the air sealing strategies, Mutual Housing first built a prototype of each building type and put the prototypes through multiple blower door tests to identify and fix air leaks.