

COMPREHENSIVE ENERGY RETROFIT

Case Study: John Wesley Miller Companies Tucson, AZ



John Wesley Miller Companies, a Building America partner and renowned Tucson-area builder, has earned Tucson Electric Power's first heating and cooling guarantee for a home remodel.

Miller overhauled a 47-year-old, 2,000-square-foot adobe home dramatically improving its energy performance and slashing heating and cooling costs by 75%. Under Tucson Electric Power's utility guarantee program, this home is guaranteed to have heating or cooling bills for 5 years that do not exceed on average \$1.26 a day, which demonstrates significant efficiency in a climate where the average summer temperature is 100 degrees.

"We modeled all of our remodeling [at this home] after what we have done at our Armory Park Del Sol development in Tucson," said Miller. At Armory Park, Miller teamed with the U.S. Department of Energy and its Building America teams to design a development of highly efficient solar homes, including one of the first true zero-energy homes in the country.

The remodeled burnt adobe home at 3002 E. Hawthorne St. is located near the University of Arizona in the Sam Hughes area, which is a neighborhood listed on the National Register of Historic Places. When remodeled, the 3-bedroom, 2-bathroom home kept the original home footprint with the exception of a new 2-car garage. Miller said that the remodeled home reaches energy savings of 66% to 75% compared to the original.

Miller had two personal motivations for purchasing and remodeling the house at 3002 E. Hawthorne Street. "House building is dead, and I want to keep my guys busy," said Miller. "We have a very specialized crew of subcontractors and our own people. I have another bias: it is only a block and a half from where I live. The home has been rented to university students for 10 to 15 years. It was a real eye sore. In all respects—environmentally, property values, historical character—it was an opportunity to turn this house around completely."



This home is the first retrofit to earn a Tucson Electric Power 5-year Heating and Cooling Guarantee.

Miller placed rigid foam insulation and a new three-coat stucco finish over the original adobe walls but kept the historic masonry parapet visible to retain the home's southwestern character.

BUILDER PROFILE

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Founded: 1956

Featured Project:

Retrofit of one adobe home at 3002 E. Hawthorne Street, in historic Sam Hughes Neighborhood, Tucson, AZ

Number of Units:

One home: 3-bedroom, 2-bath, 1-office

Square Footage:

1,990 square feet on 0.206 acres

Rehab Cost: \$100,000

"These old homes are just sucking up energy, and quite often it is the people who can least afford it who are getting the highest bills."

John Wesley Miller



The remodeled home retained the historic landscaping with plants and ground cover that require minimum irrigation.

Key Energy-Saving Features

Tucson Electric Power 5-year Heating and Cooling Guarantee for a \$1.26 average heating and cooling cost per day

1.6-kilowatt BP solar photovoltaic system

Copperheart solar hot water collector

Seisco tankless water heater

2-inch rigid R-13 insulation on roof

1½-inch rigid polyisocyanurate wall insulation (R-9.7)

Argon-filled Milgard dual-pane windows with 0.31 U-value and Suncoat™ low-e² glass

New Trane XL 19/17.6-SEER high-efficiency heat pump

Programmable thermostat

Ceiling fan with CFL lights

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Energy Efficient Features

Miller believes that by beginning improvements with the building envelope, “you reduce the need for energy significantly.”

“We started with an old adobe house that was very energy inefficient. The biggest thing we did was to put the insulation on the outside of the adobe so that the masonry structure becomes a storage system for the warmth and the cold,” said Miller.

The home’s thick adobe walls had thermal mass storage and conduction properties that could be controlled with the external insulation. The house was wrapped with rigid foil-faced 1½-inch polyisocyanurate board that was applied directly to the outside surface of the adobe. This rigid foam sheathing was extended down the wall to insulate the edge of the slab. The board was covered with a three-coat stucco finish to seal the wall and restore the adobe appearance. The brick parapet was left exposed as an architectural detail.

For the flat roof assembly, the original roofing was removed but not the framing or plywood sheathing. Two inches of polyisocyanurate rigid insulation were secured to the sheathing. On top of this insulation was placed the 3-ply built-up roof, which was painted reflective white.

The original aluminum sliding windows were replaced with argon-filled Milgard dual-pane windows, and the sliding glass doors were replaced with Milgard French doors containing SunCoat low-emissivity glass.

A Copperheart solar hot water heater was mounted on the roof and a Seisco tankless water heater was added to ensure hot water on demand. Also mounted on the roof was a wind-resistant, 1.6-kW PV system for converting sunlight to free electricity.

A Trane dual-compressor heat pump (19/17.6 SEER) was installed for heating and cooling. Ninety percent of the time the smaller compressor which uses 25% less energy is all that is needed; the larger compressor kicks in during extreme temperatures.

All incandescent light fixtures were replaced with fluorescent light fixtures and lights. Carpet was replaced with ceramic tiles, which also have thermal mass properties.

Table 1. Energy Savings equals Financial Gains for the Tucson Retrofit Home Owner

Savings	How Much
Heating and cooling costs	30% less than neighbors 75% less than pre-retrofit
Tucson Electric Power 5-year guarantee	Heating and cooling bills <\$1.26/day
Federal tax credit	\$2,000 per solar system
State tax credit	\$1,000 per solar system
Utility rebate	\$4,800 for PV \$1,300 for solar hot water

The Bottom Line

Although Miller acknowledges personal motivations for remodeling the Hawthorne house, he sees a much bigger motivation: “These old homes are just sucking up energy....I sincerely believe we should all be working to make the planet healthier. Fixing up our existing housing stock is one of the biggest places we can make a difference.”