

Appendix C-1: Case Study

SUSTAINABLE CONSTRUCTION IN INDIAN COUNTRY

REHABILITATING HOUSING TO INCORPORATE LOWER-COST SUSTAINABILITY MEASURES



Cocopah Indian Tribe

“Better housing is one of the most basic and important improvements we can make in peoples’ lives, and the jobs this creates won’t be the only benefit the community sees from this project.”

- Arizona Congressman Raul M. Grijalva



Problem

Increasing the number of tribal members living on the reservation by retrofitting and renovating existing housing to improve housing conditions and decrease energy costs.

Solution

Upgrading three existing apartment buildings with largely low-cost solutions so they become an affordable, energy-efficient model project in the community.

Community Snapshot

Location: Lying 13 miles south of Yuma, Arizona, the Cocopah Indian Tribe reservation takes in 6,500 acres, is divided into three noncontiguous areas, and borders Mexico along the Colorado River.

Location type: Rural/agricultural

Population: The Cocopah Indian Tribe has approximately 816 members.

Climate: Desert climate with extremely hot summers and warm winters. Extremely sunny, the area receives an average of 3 inches of rain annually. (Köppen classification: *BWh*)

Critical Sustainable Technologies and Strategies

- Compact fluorescent lamps (CFLs)
- Double-paned low-emissivity (low-e) windows
- Energy-efficient air conditioners
- Sustainable roofs
- Faucet aerators and low-flow showerheads
- Upgraded water heaters
- ENERGY STAR appliances

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Funding

Activity	Funding Source
Rehabilitation of three buildings with 24 units total	U.S. Department of Agriculture Housing Preservation Grant
	U.S. Department of Housing and Urban Development (HUD) Indian Community Development Block Grant
	HUD Native American Housing Assistance and Self Determination Act

Map



Summary

The Cocopah Indian Tribe seeks to encourage tribal members to stay on-reservation and to encourage members living off-reservation to return by providing affordable, safe, decent, and sanitary housing for all. To assist with this goal, Cocopah Indian Housing and Development (CIHAD) has been implementing affordable, energy-efficient changes to its older housing for the past 10 years. CIHAD Chief Executive Officer Michael Reed takes a commonsense approach to sustainability and cost savings: as old systems and appliances wear out, replace them with more sustainable products. Under the dry, hot desert conditions of the Cocopah reservation, they may wear out sooner than a system's normal anticipated life span.

Currently, CIHAD is rehabilitating three two-story garden apartment buildings that have a total of 24 apartments. The apartment buildings, built in 2003, share a site with a community building and parking area.



CIHAD corporate office, Somerton, AZ



Multifamily apartment rehabilitation project

CIHAD plans to upgrade these buildings as a sustainable, energy-efficient, affordable model project in the community. It is replacing lighting, water fixtures and fittings, appliances, air conditioning, and windows, and is making other changes. To carry out this work, CIHAD has added a new partner to the mix: its utility provider. The Tribe worked with Arizona Power Service (APS) to take advantage of an incentive program which provided free compact fluorescent lamps (CFLs), faucet aerators, and low-flow showerheads. In addition, it worked with building residents

and APS to receive utility cost data from a 12-month period for one of the buildings. The data were analyzed to create a cost and usage baseline that will help guide future energy-efficiency strategy decisions. Reed said, "It is too soon now to see if we have cost savings and how much. We have a baseline and in a year we will see if electricity use has improved."

The following chart describes the technologies and their effect on sustainability.

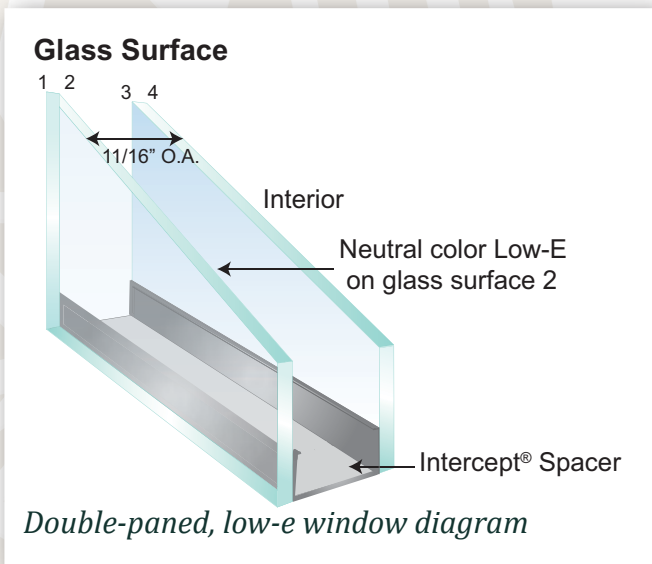
Sustainable Technologies	What Is It?	Effect
Compact fluorescent lamps (CFLs)	CFLs are made of glass tubes filled with gas and a small amount of mercury (100 times less than a thermometer). The mercury emits an invisible ultraviolet light that becomes visible when it hits the white coating inside the CFL.	Switching to energy-efficient lighting is one of the fastest ways to cut energy bills. CFLs last about 10 times longer and use about 75% less energy than traditional incandescent bulbs. A typical CFL can pay for itself in energy savings in less than 9 months and can continue to cut energy costs each month.
Low-e windows	Low-e, or low thermal emissivity, windows have a coating on the glazing or glass that absorbs, reflects, and emits low levels of radiant thermal (heat) energy depending on the weather.	Low-e windows typically cost about 10% to 15% more than regular windows according to the U.S. Department of Energy (DOE), but they may reduce energy loss by as much as 50%. The greatest savings tend to come from areas with hot summers, cold winters, or both.
Energy-efficient air conditioning (high Seasonal Energy Efficiency Ratio or SEER)	The efficiency of air conditioners is often rated by the SEER defined by the Air Conditioning, Heating and Refrigeration Institute. The higher the unit's SEER rating the more energy efficient it is.	High-efficiency air conditioners result in lower monthly energy bills and often include additional energy-saving features.
Sustainable roofs (30-year shingles)	Various factors such as the thickness of the shingle, the materials from which it is manufactured, and the amount of asphalt used determine the length of warranty on the shingle.	These shingle roofs are intended to last for a longer time than their 10-15 year predecessors. This is both financially and environmentally desirable.
Faucet aerators and low-flow showerheads	Aerators use specialized airflow regulators to mix water and air to reduce water flow while increasing pressure. Low-flow showerheads also significantly reduce water flow.	The aerators use 1.5 gallons per minute, or 31% less water than a standard faucet. The low-flow showerheads use 1.5 gallons per minute, 20% less water than standard showerheads, according to the Arizona Power Service (APS). By using a lower flow faucet, less energy is used for heating hot water for everyday use. APS estimates that \$246 in utility bills and 8,212 gallons of water per year will be saved.
ENERGY STAR appliances	ENERGY STAR appliances are independently certified through a program of the U.S. Environmental Protection Agency (EPA) and the DOE.	The products save money and protect the environment. For example, replacing a 1980s model refrigerator with an ENERGY STAR version could save \$100 a year in total energy costs. Replacing a clothes washer could save as much as \$110 a year.

Rehabilitation and Climate

In recent years, CIHAD has been renovating tribal homes with U.S. Department of Housing and Urban Development (HUD) and U.S. Department of Agriculture (USDA) grants. Fifty of the “oldest and most in need” homes on the reservation received major rehabilitation, including new roof shingles, heat/air conditioning systems, ductwork, floors, baseboards, exterior and interior doors, security screen doors, 200-amp electrical systems, dual-pane windows, and exterior and interior paint, according to an article in the *Yuma Sun*. Kitchen and bathroom upgrades involved installing new appliances, cabinets, countertops, vanities, showers, towel bars, medicine cabinets, exhaust fans, toilets, and plumbing.

Currently, CIHAD is undertaking rehabilitation on three garden-style apartment buildings that were built in 2003. Each all-electric building has eight units (four two-bedroom and four three-bedroom units), and split-system electric heat pumps (which include cooling systems). Each building is 8,523 square feet, with apartments ranging from 855 to 1,107 square feet. On the same lot are a community building with a common laundry area and parking.

Temperatures of up to 124 °F and the hot summer sun can shorten the lifespan of some materials and appliances. Some of the first upgrades the CIHAD maintenance team is making to the three buildings—Seasonal Energy Efficiency Ratio (SEER) 14 air conditioners and 30-year shingles on the roof (rather than the old 10-15 year shingles)—should help with cooling. The region also has hard water, which causes deterioration in the water heaters. As these water heaters give out, they are being upgraded to more energy-efficient models.



Windows were added into the mix when they began to experience problems. CIHAD will replace windows in all three buildings with double-paned, low-e models, which will come at a cost of \$1,480 per apartment. The Tribe anticipates that replacing the lighting, windows, stoves, and refrigerator will take 18 months. An additional benefit of the project is that CIHAD’s own staff, more than one-half of whom are tribal members, will conduct the work.

Community Involvement

CIHAD held two public meetings at the complex to inform tenants about the planned changes to the windows and lighting. CIHAD staff are also walking tenants through these changes as they install new windows, CFLs, and lighting fixtures, and make more renovations in the apartments.



Utility Company Opportunities

Utility companies are motivated to encourage smart energy use and energy efficiency to provide more consistent, efficient, and cost-effective power. Companies such as APS offer free or low-cost energy-efficiency services, incentive programs, and rebates to their customers. Tribes sometimes may be hesitant to reach out to utility company programs, but as paying customers of a utility, tribes, tribally designated housing entities (TDHEs), or tribal housing residents (depending on who pays the utility bills) may have access to a range of programs and incentives.

Assessments and Incentives

Many utilities offer energy-efficiency assessment services. APS offers a Multifamily Energy Efficiency Program that provides eligible building owners a free onsite energy assessment to identify quick areas of upgrade for energy savings, free energy cost reduction measures (ECRMs), and technical and field support to assist with installation. In May 2012, the Tribe requested an onsite energy assessment of one of its buildings. APS conducted an assessment of the eight apartments' lighting and water features. APS installed the following ECRMs at no cost:

- 24 kitchen faucet aerators and 36 bathroom faucet aerators.
- 38 low-flow showerheads.
- 360 CFLs.

Other utility companies may partner with HVAC consultants to offer thorough energy assessments. The HVAC consultant observes the housing from top to bottom, noting features from insulation levels to water heater age and model. These assessments likely have an associated fee (although less than would be charged without the program) and come with recommendations that the utility may assist in funding.

Most commonly, utilities provide their customers with rebates. The occupant or TDHE purchases a qualified heating and cooling system or appliance. It then submits paperwork including a receipt to receive a cash rebate.



Low-flow showerheads and faucet aerators



Benchmarking

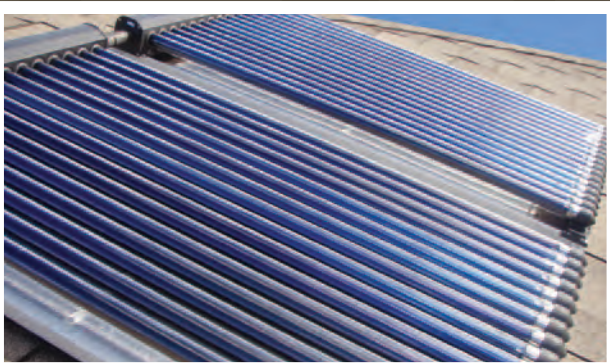
Benchmarking is a method that facilitates energy accounting, comparing a facility's energy use with that of similar facilities to assess opportunities for improvement and quantify energy savings. Because CIHAD tenants pay their own APS electric bills with a utility allowance provided by the housing department, CIHAD initially did not have access to usage data for its buildings. Each tenant household provided APS with a signed release form, enabling APS to send CIHAD cost and kilowatt-usage data for the period of 1 year.

A HUD Sustainable Construction in Indian Country (SCinIC) initiative team including the University of Illinois Urbana Champaign Building Research Council conducted a comprehensive energy analysis of the eight units of Building B, one of the three garden apartment buildings, for the 2011 calendar year. The SCinIC team plugged those figures into a modeling program to calculate a baseline usage for the building and to make recommendations for ECRMs. CIHAD can also use this initial baseline to measure its success in reducing energy usage and cost in future years.



Apartment building electricity meters

Renewable Energy and Net Metering



Solar domestic hot water

APS also offers renewable energy incentive programs, including photovoltaic array and solar domestic hot water incentive programs; these are not available to the CIHAD, but to individual customers. Program members can also participate in APS' net metering program. In this program, if the renewable resource produces more power than is needed for the home, the electricity is fed back into the power grid and the participant's utility account is credited.



Photovoltaic (PV) array

Project Summary

PROJECT NAME: Multifamily Buildings

LOCATION: Somerton, Arizona

TIMELINE: 2011 though present

PROJECT TYPE: Multifamily apartment rehabilitation

Project Key Features

- Free incentives from the local utility company.
- Individual heat pumps.
- Associated community building.
- Common laundry area.

Key Sustainable Elements

- CFLs.
- Low-e windows.
- High-SEER air conditioning.
- Thirty-year shingles.
- Faucet aerators and low-flow showerheads.
- Upgraded water heaters.
- ENERGY STAR appliances.
- Benchmarking.



Thirty-year shingles



Low-e windows



High SEER air conditioning



Best Practices

CIHAD has focused its initial energy-efficiency upgrades on the most affordable strategies—but these upgrades can have major consequences for a housing authority’s or an occupant’s bottom line.

The SCinIC energy assessment report compared cost and kilowatt usage for incandescent lighting and CFLs. It estimated that the building would save \$282 annually through this simple upgrade. The cost of interior lighting with incandescents in one apartment building was estimated at about 21 percent of the building’s total costs. The upgrade to CFLs, even when factoring in the cost of the CFLs, is estimated to pay for itself in less than 18 months and to save the building 2,171 kilowatts annually. (In this case, CIHAD did not have to purchase 360 CFLs because of its participation in the APS program.)



CFL Lighting upgrade				
Annual Savings per building				
Kilowatts	Dollars	Percent of Energy	Cost of Installation	Simple Payback
2,171	\$282	3%	\$395	1.4 years

CIHAD also had bathroom and kitchen aerators, and low-flow showerheads installed through the APS program. These items are not costly. Aerators cost between \$5 and \$10 each and less expensive low-flow showerheads between \$15 and \$50, but they can also bring in big savings. According to the U.S. Environmental Protection Agency’s (EPA’s) WaterSense program, the average household spends as much as \$500 per year on water and sewer bills and can save about \$170 per year by installing water-efficient fixtures and appliances.

CIHAD is replacing refrigerators, air conditioners, and water heaters as they wear out. Refrigerators consume the most energy of all household appliances because they operate 24 hours a day. The units' original refrigerators (1995 models) are estimated to cost \$112 annually to run, compared with only \$51 annually for an equivalent new ENERGY STAR model. This upgrade could save each tenant \$61 per year.

Refrigerator upgrade				
Annual Savings per building				
Kilowatts	Dollars	Percent of Energy	Cost of Installation	Simple Payback
3,754	\$488	6%	\$3200	6.56 years



By starting with less expensive changes and replacing systems as they wear out, CIHAD and its residents can expect to see some quick return on their investment with cost and energy savings.

Next Steps

The Tribe has been renovating homes on the reservation for the past 10 years. The original focus of the current retrofitting project was three apartment buildings, but now the Tribe plans to make the same energy-efficient improvements to the remainder of its housing.

Many of the changes CIHAD is making to the three garden apartment buildings are the most affordable, quickest return options, but it is also considering more extensive sustainable upgrades for the future. According to Reed, although CIHAD is currently installing a 30-year upgraded shingle roof, it is looking at more expensive/durable roofs for the future, although “we’re not there yet.” CIHAD is also looking at solar panels for existing projects. Reed noted CIHAD is using the current projects as a pilot “to see if we break even.”

The SCinIC report recommended adding window shading to the exterior of the building, protecting windows and apartments from the sun. Although this upgrade was estimated to cost about \$2,000 per building, it had an anticipated payback time of slightly more than 8 years and an estimated annual utility cost savings of about \$242.

CIHAD also is planning to include sustainable features in their new construction. It is submitting plans to Indian Community Development Block Grant to add infrastructure for two new homes on the North Reservation—and, in the long run, will seek funding for 14 homes on the lots. In the proposed rental housing units, Reed said, “We will do everything we can—lighting, higher R-factor walls, high SEER, nice 30-year roofs, stucco,” depending on available funding. He also noted that CIHAD may choose totally different options in the future. For example, he said, “I like the idea of not having a hot water heater because water is so poor here, so we are open to other options.” CIHAD will continue to apply for a variety of federal and state grants as they become available to continue financing its sustainable rehabilitation projects.

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How To Get Started

To learn more about utility program incentives and energy-efficient lighting, appliances, benchmarking, and the energy assessment report, check out these resources.

Database of State Incentives for Renewables & Efficiency on utility company and other incentives:

<http://www.dsireusa.org/>

EPA on energy efficient improvements, including low-e windows:

<http://www.epa.gov/greenhomes/ReduceEnergy.htm>

EPA on CFLs:

<http://www2.epa.gov/cfl/>

ENERGY STAR on appliances:

http://www.energystar.gov/index.cfm?c=products.pr_find_es_products

Energy Efficiency Evaluation and Recommendations: 14380 S. Farm Road Multifamily Housing

http://www.huduser.org/portal/SCinIC/EnergyAssessment_Cocopah11_28.pdf

APS:

<http://www.aps.com/>

DOE and EPA ENERGY STAR on benchmarking for multifamily housing programs:

http://www.energystar.gov/index.cfm?c=multifam_housing.bus_multifam_housing

CIHAD:

<http://www.ontherez.org/>

This best practice case study is one in a series that examines how Native American and Alaska Native communities have incorporated sustainable technologies and strategies into their housing development.

The Sustainable Construction in Indian Country initiative was created to support and increase sustainable construction practices in Native American communities. It is administered through the U.S. Department of Housing and Urban Development's Office of Policy Development and Research in partnership with the Office of Native American Programs.

Some photos, tables, and renderings courtesy of CIHAD and the University of Illinois Urbana Champaign Building Research Council.

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