



Site Planning • Alternative Transportation • Energy Efficiency • Renewable Energy • Resource Conservation • Resident Health

# SOLARA

13414 COMMUNITY ROAD  
POWAY, CALIFORNIA 92064

SOLARA breaks new ground in the field of green affordable housing as California's first apartment community designed to be fully powered by the sun. SOLARA's 141 kilowatt, grid-tied photovoltaic (PV) system supplies power separately to each of the project's 56 energy-efficient apartment units, community center, and common areas. While SOLARA was built exclusively with easily obtainable off-the-shelf technology, its major breakthrough was financial. By taking advantage of funding sources available to most new affordable housing projects in California, the development team was able to cover more than 92% of the cost of the \$1.1 million solar system with incentives and create a business model that can be replicated in affordable housing developments across the state.

SOLARA's energy efficiency and renewable energy package may be its most obvious green feature, but the foundation of SOLARA's success as a green affordable housing project lies in the design team's holistic approach to sustainable development. The team focused on core elements such as community access and walkability, indoor environmental quality, water efficiency, and resource conservation throughout the design and construction process. The result is proof that quality, innovative, and environmentally-friendly housing can be accessible to everyone.

## PROJECT INFORMATION

**Completion Date**  
Summer 2007

**Owner/Developer**  
Community HousingWorks

**Solar Integrator**  
Solar Power, Inc.

**Project Size**  
56 units in six two-story buildings & a 2,100 s.f. community center on 2.5 acres of urban infill

**Architect**  
Rodriguez Associates

**Green Building/Renewable Energy Advisor**  
Global Green USA

**Project Cost**  
\$16.2 million

**General Contractor**  
Sun County Builders

**Energy Efficiency Analysis/Monitoring**  
CTG Energetics

**Construction Cost**  
\$11.36 million (\$315 / s.f.)

**Funding Partner**  
National Equity Fund, Inc.

**Financial Consultant**  
California Housing Partnership

## INTEGRATED DESIGN

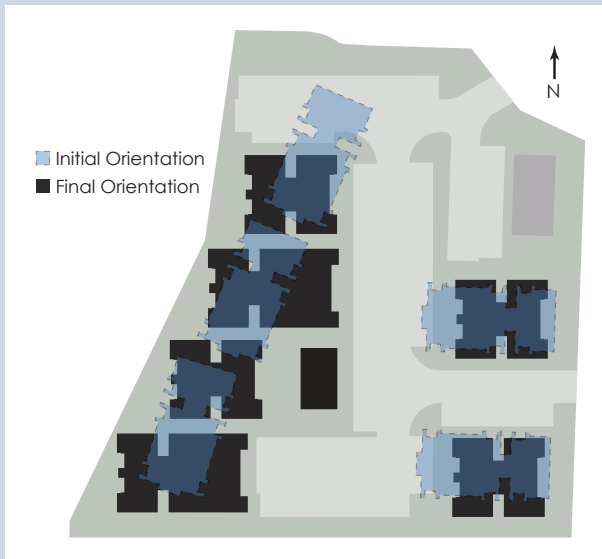
The selection of green building features at SOLARA was the result of an integrated design approach that focused on key performance goals such as energy use and resident health. For example, the amount of solar energy necessary to power the project was minimized by lowering electricity demand through proper solar orientation of the buildings, efficient heating and cooling systems, and energy-efficient lighting and appliances.

Indoor air quality was addressed first by designing the living units for cross ventilation and then incorporating finish products with low levels of volatile organic compounds (VOCs).

Moreover, SOLARA was designed to offer its residents a comfortable, community-oriented living environment. The development shares its western boundary with Rattlesnake Creek – a natural greenway – and is within walking distance of Poway City Hall, a library, schools, major transit lines, retail, and other services.

SOLARA offers its residents a number of classes in job training, computer skills, and financial fitness. These activities are complemented by an innovative bilingual Green Curriculum focused on energy conservation, recycling, and non-toxic cleaning and maintenance practices.

## Site Orientation



Faced with the tight budget of an affordable housing project, the SOLARA project team had to analyze the site's ecological conditions in order to harness as many low-cost energy efficiency and ventilation strategies as possible. For example, early energy modeling showed that the initial site design (in blue) was less than optimal for deploying passive solar strategies and capturing prevailing winds.

Because this discovery was made early in the design process, it was possible to reorient the buildings (in black), which, in addition to maximizing energy efficiency, made it easier to position the roof-top solar panels for maximum electricity generation.

## GREEN FEATURES

### Energy Efficiency

- Low-E windows
- Radiant barrier roofing
- Central, high-efficiency, tankless water heaters for water and space heating
- SEER 13 and 14 air conditioning with non-HCFC refrigerant
- 100% pin-type fluorescent lighting
- ENERGY STAR appliances
- Exceeds Title 24 (2005) by 15%

### Renewable Energy

- 141 kW photovoltaic system supplies electricity to all units, common areas, and parking areas

### Water Efficiency

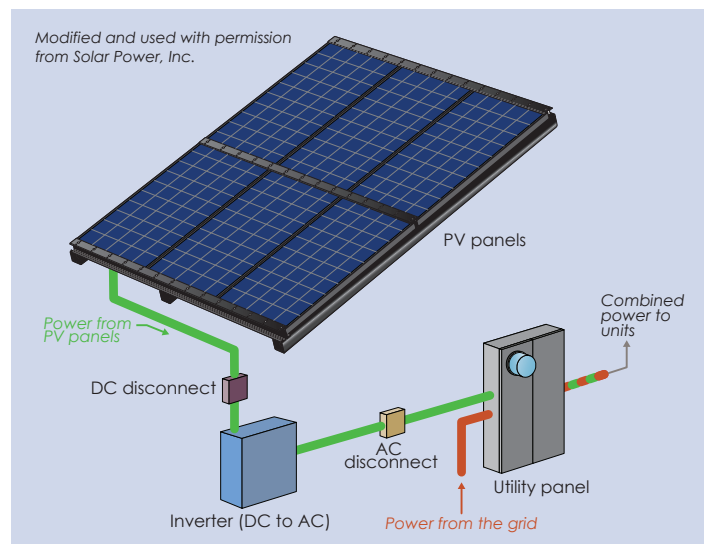
- Dual flush toilets
- Native, drought-resistant plants with low water needs

### Recycled Materials

- Fly ash in concrete
- Natural linoleum in kitchens and bathrooms
- Composite (plastic and wood) recycled decking
- Recycled paper wall surface in the Learning Center

### Indoor Air Quality

- Low VOC paint
- Cross-ventilation and windows in most bathrooms
- Green Label Plus carpets
- Wood cabinets sealed against formaldehyde leakage
- Bathroom fans with timers to help prevent moisture accumulation and mold growth
- Formaldehyde-free insulation



Each living unit has its own dedicated solar PV system, allowing residents to track their energy use and savings.

### Resident Life

- Preoccupancy green briefings for residents
- Green Curriculum in the Learning Center
- Families supplied folding shopping carts to encourage shopping at local establishments without driving
- Community center resources include: job training, computer skills, leadership, and financial fitness
- Individual solar energy consumption monitoring
- Six on-site public art installations
- Meyer lemon grove with edible citrus
- Family recreational area

## FUNDING

SOLARA's principal funding structure is similar to most affordable housing projects. Federal Low Income Housing Tax Credits, administered through the California Tax Credit Allocation Committee's (TCAC) low income housing tax credit program, account for most of the project's \$16.2 million budget.

What sets SOLARA apart are the additional rebates and tax credits it received for achieving high levels of energy efficiency and incorporating an extensive renewable energy system.

Additional sources include a state rebate for photovoltaics, additional Low Income Housing Tax Credits from TCAC, and federal business investment tax credits for renewable energy systems. While these sources are widely available, the project team had to work diligently to meet all of the regulatory requirements to capture them.

Total Funding Sources	
Union Bank of America	\$2,369,500
City of Poway Redevelopment Agency	\$775,000
County of San Diego Housing	\$1,000,000
Deferred/Accrued Interest	\$28,000
CEC Utility, Tax Reimbursement	\$123,605
CEC Energy Rebate	\$409,000
Capital Contribution: General Partner	\$100
Capital Contribution: National Equity Fund, Inc.	\$11,266,278
Capital Contribution: Investment Tax Credit (NEF)	\$208,011
<b>Total</b>	<b>\$16,179,494</b>

Electricity consumption is included in the rent paid by SOLARA residents. This allows the developer to capture the value of the electricity utility allowance, which increases overall project cash flow. Some of this additional cash flow was leveraged to increase the size of the project's conventional debt burden, with other funds used to cover utility interconnection payments and reserve requirements for future replacement of PV system components.

One major financing breakthrough at SOLARA involved having the tax credit syndicator bundle the federal renewable energy tax credits with the Low Income Housing Tax Credit and pay the same rate for them. This required extensive education of the syndicator on the long-term benefits and reliability of solar technology as well as introducing them to a new financing stream. Ultimately, this additional tax credit netted the project over \$200,000 in extra equity.

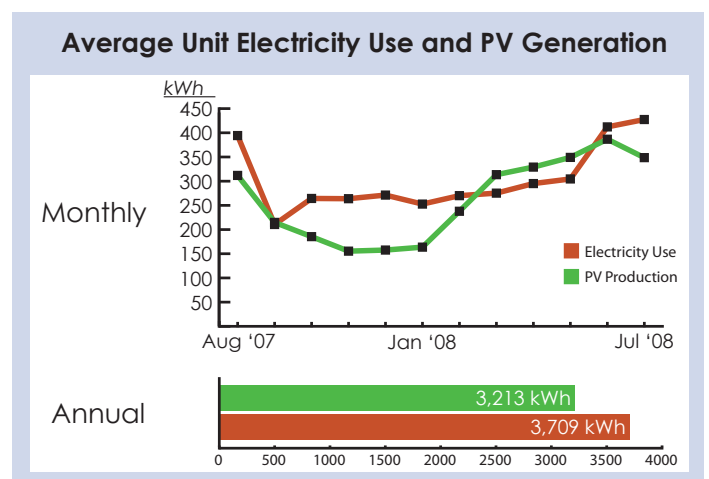
Solar Funding			
Cost of Solar PV System		Funding for PV System	
<b>Base Cost</b>	\$967,500	<b>CEC Rebate</b>	\$409,000
		<b>Add'l. Tax Credits</b>	\$405,000
<b>Additional Costs<sup>1</sup></b>	\$135,500	<b>Fed. Tax Credits</b>	\$208,000
		<b>Increased Debt</b>	\$81,000
<b>Total Cost</b>	<b>\$1,103,000</b>	<b>Total Funding</b>	<b>\$1,103,000</b>

<sup>1</sup> Includes scope of work for other trades, general contractor costs, insurance and bonding.

## COST SAVINGS

A monitoring system was installed at SOLARA to track energy use, solar PV production, and ultimately, cost savings to the developer and tenants. In the first year of full operation, the average unit at SOLARA met 87% of its electricity needs through its on-site PV system, and annual electricity bills were 68% less – a \$264 savings – than they were at a nearby affordable housing development (\$126/unit vs. \$390/unit).

Most of the cost savings accrue to the developer, while tenants benefit from a fixed monthly utility charge, insulating them against future energy cost increases and seasonal volatility.



## CHALLENGES

*Even with a committed developer and experienced design team, SOLARA faced a number of challenges in the process of creating a successful and innovative green project.*

**“Greening” the Design Team** – Several members of the design team had little experience in the field of sustainable development, which resulted in a need for extensive education. However, this need ultimately strengthened lines of communication amongst team members throughout the design and construction process, and increased their capacity to take on similar projects in the future.

**Integration of Design and Finance** – Structurally, the financing package for the energy efficiency measures and solar PV system remained fairly steady throughout the project – tax credits, rebates, and permanent debt financed by cash flow. However, each design modification, such as a change in air conditioning efficiencies or a reduction in the angle of the solar panels, altered a complex set of financial formulas, further complicating the design challenge. A clear set of performance goals helped keep the entire project team on track.

**Density and Design** – Finding roof space for enough PV panels to pursue zero-energy goals is a challenge on dense sites, even with the implementation of aggressive energy efficiency measures. The project team discovered a rule-of-thumb that on a conventionally framed project with mechanical cooling, it would be nearly impossible to go above two story buildings and still achieve the energy performance targets. Even at two stories, SOLARA needed to place about one-third of its PV panels on carports to compensate for roof space lost for fire code reasons and less than optimal PV panel tilt angles required by the City of Poway due to aesthetic concerns.

**Utility Payment and Metering Structure** – SOLARA's project team faced a major financing challenge in the area of electricity metering and bill payments. In an attempt to promote energy efficient practices, California codes require that each apartment unit be individually metered for electricity. For SOLARA, this meant each unit needed its own individual solar PV system and inverter, greatly increasing cost and design complexity. Utility allowance regulations also forced the developer – if they wanted to recoup any of the investment in the solar system – to agree to pay for all potential excess electricity consumption by residents, thus cancelling out the benefits of individual meters. Prompted by the experience at SOLARA, regulatory changes have been made to provide more flexibility on metering and utility allowances for projects that include renewable energy installations.

**Photovoltaic Panel Supply** – There was concern that with such an extensive solar power system, not all of the panels would be available in time to keep the project on schedule. If SOLARA had been behind schedule, it could have lost as much as \$100,000 a month in equity. Likewise, if the panels had arrived too early, it would have been necessary to properly store and insure them, which also would have had cost implications. The design team developed a close relationship with the solar panel provider to ensure the panels would be delivered on time.

## CONTACTS

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