



ConSol

RESNET

February 2003

Zero Energy Home Project

- **DOE / NREL: 4 Teams**
 - ConSol, DEG, NAHB-RC, SWA
- **ConSol Team**
 - ConSol
 - Centex (LA)
 - Shea (San Diego)
 - Pardee (LA & Las Vegas)
 - Morrison (Sacramento)
 - Clarum (SF Bay Area)

www.consol.ws

Zero Energy Home Program

- Initial Goals
 - 60% Reduction in Energy Bill
 - Annual Net-Zero Electricity Use
- Ultimate Goal
 - Net Zero Annual Energy Use
 - Communities by 2010



ConSol Approach

- Production Builders
- ComfortWise *Plus*
- Solar Hot Water
- Solar Electric (Photovoltaic -- PV)

Core Energy Program



ComfortWise

★ Efficiency & Quality Construction Program



Energy design and analyses

Higher efficiency, more rigorous than Energy Star

Third party inspections & diagnostics

Home energy rating

★ Marketing

Advertising

Web Page

Sales Support



www.comfortwise.com

ComfortWise

- Mandatory Efficiency Features
 - SSG, tight ducts, mechanical design
- Exceeds Energy Star
 - 15% over CA energy code
- Quality Construction
 - Scopes of Work
 - 3rd party inspections and tests
 - Insulation; air sealing; windows; mechanical
- Home Energy Rating

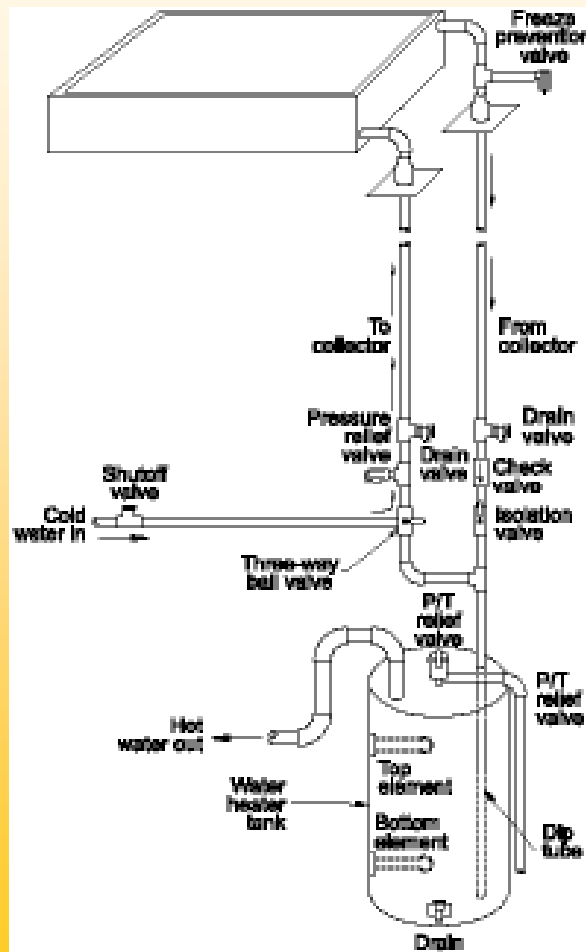
ComfortWise *Plus*

- Improved Passive Solar Design
 - Overhangs
 - Shading
- Radiant Barrier
- Ducts in Conditioned Space
- High Efficiency Furnace and Air Conditioner
- High Efficiency Lighting
- Energy Star Appliances

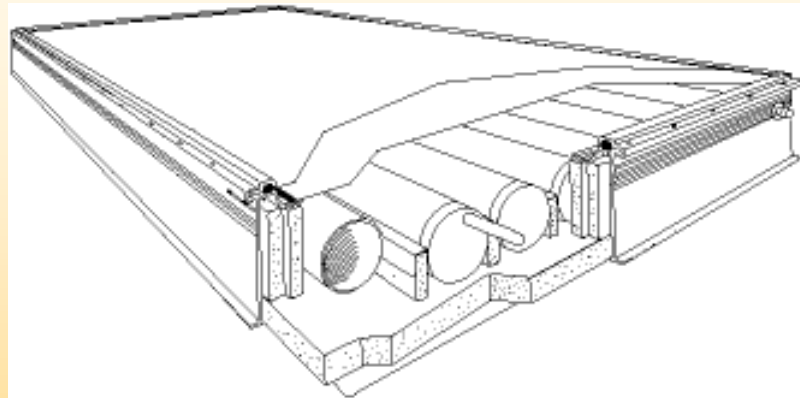
Solar Hot Water

- Passive
 - Simple, reliable
 - Lower cost (approx. \$1,500 installed)
 - Freezing
- Active
 - More complicated: pumps & valves
 - Freeze protection

Integral Collector Storage (ICS) Solar Water Heater



Integral collector storage system



ICS collector



Photovoltaic System

- Solar Energy \Rightarrow Electricity
- Roof or Trellis Mounted
- Typical 2.4 kW System
 - Range 1.2 – 3.2 kW
 - 2.4 kW \sim 240 sqft
- Grid-Connected; Net Metered
- Approx Cost (panels):
 - \$6.50 - \$8.50 per watt, installed
 - CEC buydown \$4.00/watt or about 50%

Photovoltaic Systems



Zero Energy Home Benefits

- Comfort
- Quality
- Efficiency
- Utility Cost Savings
- Resale Value
 - Protection from increased electricity rates
 - Improved value
- Market Differentiation

Example Feature Set

	<u>Base</u>	<u>ComfortWise</u>	<u>ZEH</u>	<u>Costs</u>
<u>Envelope</u>				
Roof	R-38	R-38	R-38	\$300
Wall	R-13	R-13 + R4.2 foam	R-13 + R4.2 foam	
Radiant Barrier	No	No	No	
Low Air Infiltration	No	Yes	Yes	
Windows	Vinyl, Low-e	Vinyl, Low SHGC	Vinyl, Low SHGC	
<u>HVAC</u>				
FURN AFUE	0.78	0.80	0.92	\$400
A/C SEER	10	10 w/TXV	14 w/TXV	\$1,000
Duct Location	Attic	Attic	Attic (buried in insulation)	
Duct Sealing	Sealed	Sealed	Sealed	
ACCA Design	No	Yes	Yes -- Short Runs	
<u>Water Heating</u>				
Tank	50 gal storage	50 gal storage	Tankless	\$1,000
EF	0.60	0.60	0.82	
Solar	N/A	N/A	N/A	
Distribution	Standard	Standard	Pipe insulation	\$75
		ComfortWise inspections and tests		\$440
			Fluorescent Lighting	\$660
			2kW PV	\$8,000
				\$11,875

Goals Attainment

		Morrison "Lakeside" Plan 4					
		Code House			ZEH		
		Energy Use		Dollars	Energy Use		Dollars
		Therms	kWh	\$	Therms	kWh	\$
Energy Code Related							
Space Heating		464		\$ 348.11	346		\$ 259.84
Space Cooling			2987	\$ 248.53		1161	\$ 96.62
Water Heating		237		\$ 177.44	175		\$ 131.39
Other Uses							
cooking		44		\$ 33.00	44		\$ 33.00
microwave			209	\$ 17.39		209	\$ 17.39
dishwasher			361	\$ 30.04		361	\$ 30.04
cloths dryer			700	\$ 58.25	35		\$ 26.25
refrigerator			1100	\$ 91.53		1100	\$ 91.53
Miscellaneous			1800	\$ 149.78		1088	\$ 90.55
reduce kWh by solar contribution				n/a		-3,060	\$ (254.62)
Total use		745	7157	\$ 1,485.27	601	859	\$ 521.99
			1343	\$ 123.77	/mo		\$ 43.50 /mo
							65% bill reduction
price of gas/therm		\$ 0.75					
price of electricity/kWh		\$ 0.08	up to kWh 1100				
		\$ 0.13	beyond 1100				

Next Steps

- Construct Model Home
 - ◆ Monitor costs and problems
 - ◆ Address construction issues
 - ◆ Opens April 03
- Provide Sales and Marketing Info for ZEH
- Monitor Energy Use
 - ◆ Bill data
 - ◆ Monitoring

