



2013 Solar Homes Tour

The Road to Net Zero Energy

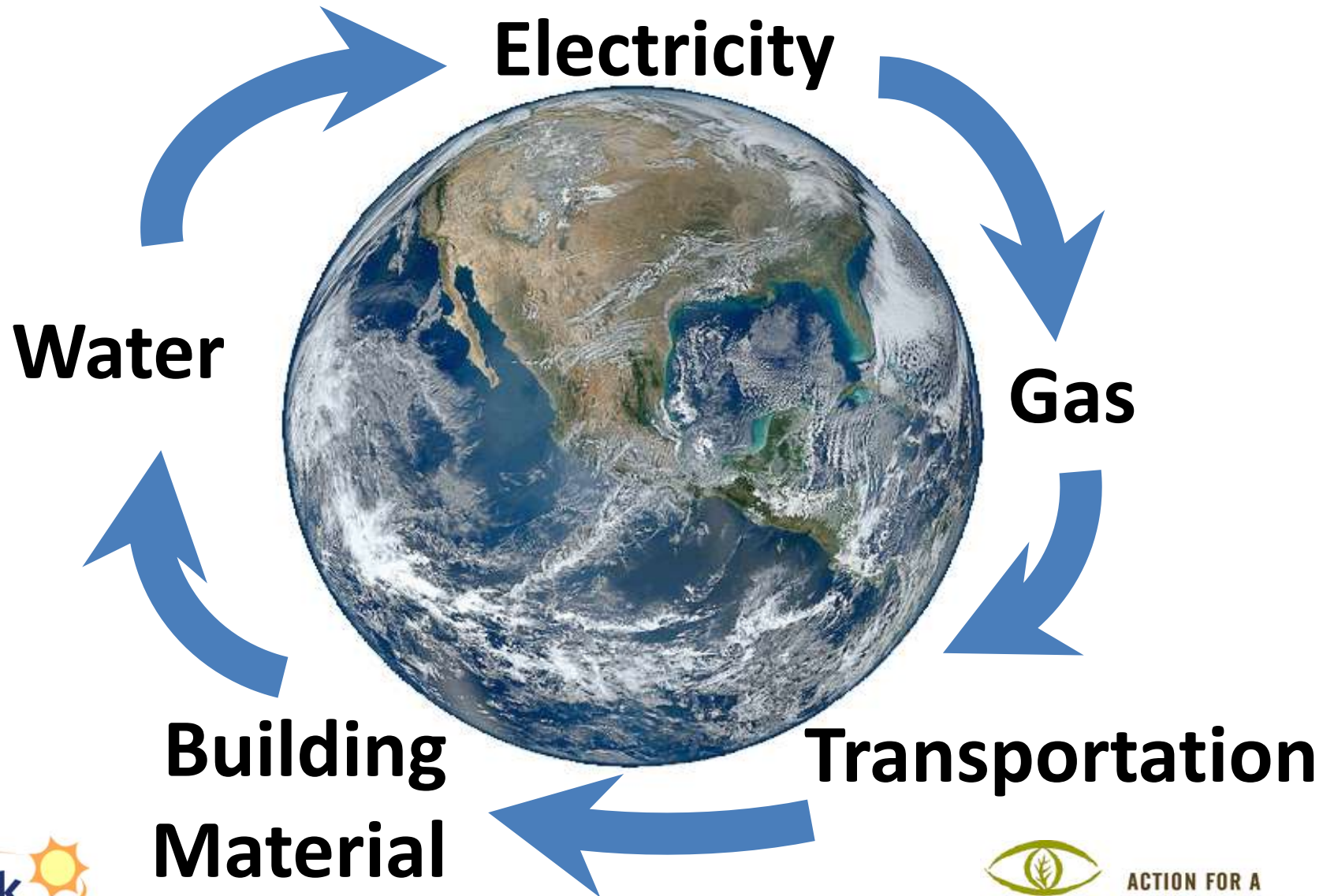
2013 Solar Homes Tour

The Road to Zero-Net Energy

- Zero-Net Energy – What is it?
- Solar PV – how it works and purchasing tips
 - Mike Balma, SunWork
- Green@Home Program
 - Debbie Mytels, Acterra
- City of Palo Alto Utilities programs, rebates & EcoHome demonstration
 - Lindsay Joye, PE
- Review of tour homes and maps
 - Mike Balma, SunWork
- 1pm Solar Homes Tour opens

Energy Use Around the Home

Tour homes demonstrate dramatic savings - many are net zero energy



Net Zero Energy Home

Many Definitions

Electric Only – Simple Case

- Annual consumption of electricity is “0”
- Typically covered by Solar electric PV
(producing more energy in summer & less in winter)
- Ability to run the meter backward is called net metering

Electric and Gas – Calculations Required

- Purchase Carbon Offsets
- Generate over 100% Solar PV

Net Zero Energy Home

Key to Success Before Solar

- ✓ **Tight building envelope**
- ✓ **Insulation everywhere**
- ✓ **Efficient heating & cooling**
 - **Radiant floor**
 - **Heat pump**
- ✓ **Efficient appliances & no vampires**



Passive House Certified

- ✓ Tight envelope – less than .6 air exchanges per hour
- ✓ Fresh air with heat recovery ventilator > 75% efficient
- ✓ Annual heat requirement $\leq 15 \text{ kWh/m}^2/\text{year}$
- ✓ Primary energy $\leq 120 \text{ kWh/m}^2/\text{year}$

"ACTIVE" FEATURES

1. SOLAR PANELS GALORE

EVERY SOUTH & WEST FACING ROOF SURFACE COVERED IN SOLAR PANELS FOR 15kW OF ENERGY FROM THE SUN. THE ROOFS WERE DESIGNED TO MAXIMIZE THIS POTENTIAL.

2. GREYWATER RECYCLING

WATER USED IN THE HOUSE IS CAPTURED AND REUSED IN THE LANDSCAPE (EXCLUDING TOILET & KITCHEN SINK WATER)

3. RAINWATER HARVESTING

ALL WATER FALLING ON THE HOUSE IS CAPTURED AND STORED FOR REUSE IN THE LANDSCAPE, THE TOILETS, AND EVEN THE WASHING MACHINE! THAT MEANS THE LAUNDRY WILL SMELL LIKE A SUMMER RAIN, NATURALLY!

4. KEEP ENERGY USE DOWN

"HIGH-EFFICACY LIGHTING" (LED LIGHTS) THROUGHOUT FOR ENERGY EFFICIENCY. MOTION SENSORS TURN OFF LIGHTS AND WATER HEATING IN UNATTENDED SPACES.

5. RECYCLED MATERIALS

THESE BRICKS ARE RECYCLED FROM A BUILDING RECENTLY DEMOLISHED AT STANFORD UNIVERSITY WHICH, FOR THIS OWNER, ALSO DOUBLES AS AN ALMA MATER!



PHOTO: © BERNARDO GELJALVA PHOTOGRAPHY
IMAGE: © FGY ARCHITECTS, PALO ALTO, CALIFORNIA

"PASSIVE" FEATURES

1. SEAL IT TIGHT

THE GOAL HERE IS TO CONTROL THE AIR FLOW MECHANICALLY THROUGH AN "HRV" (HEAT RECOVERY VENTILATOR). TO DO THIS ALL EXTERIOR PLYWOOD CONNECTIONS (WALLS, ROOFS, INTERSECTIONS WITH WINDOW AND DOORS OR OTHER PENETRATIONS) ARE SEALED WITH ONE OF 2 TYPES OF SPECIAL TAPE

2. SUPER INSULATE IT

IN ADDITION TO STANDARD WALL INSULATION, THE EXTERIOR PLYWOOD (WALLS AND ROOF) AND BASEMENT CONCRETE FOUNDATION WALLS & FLOOR ARE WRAPPED IN A RIGID FOAMBOARD INSULATION LAYER.

3. CONTROL THE OPENINGS

TO PREVENT THE INTERIOR TEMPS FROM REQUIRING HEAT OR A/C TO MAINTAIN COMFORT, TRIPLE-PANE LOW-E WINDOWS WITH PASSIVE-HOUSE RATED FRAMES (REDUCED AIR LEAKAGE) ARE STRATEGICALLY LOCATED TO ALLOW DESIRABLE WINTER SOLAR HEAT GAIN IN, WHILE KEEPING UNDESIRABLE SUMMER HEAT OUT.

4. KEEP IT DRY

BECAUSE THE HOUSE IS SEALED SO TIGHTLY, SIDING IS UNDERLAYED WITH A "RAINSREEN FABRIC" TO ALLOW WATER & CONDENSATION TO EXIT BEFORE IT CAN CAUSE A PROBLEM.

Home Electrification

66% Reduction

COOKING

40% efficient
Gas cooktop



\$2000

85% efficient
induction cooktop

GE

2X

WATER HEATING

58% efficient
Gas water
heater



\$2000

Heat pump
Water heater
Efficiency: 100% – 300%
2X – 5X

GE, 190 L, Energy Factor: 2.4

HEATING/COOLING



+



\$8500

Air Source Heat pump
Efficiency: 200% – 400%
2X – 4X

Rheem, 3 Ton
16 SEER
HSPF 10
5KW, Aux

200% efficient
AC

80% efficient
Gas furnace

Source: Indra Ghosh

Hot Water Heating

Gas vs Hybrid Electric

	Palo Alto*	Palo Alto*
	Gas (60% eff.)	Hybrid Electric
Initial \$ after rebates	\$1,200	\$2,100
Fuel (10 yr)	<u>\$2,015</u>	<u>\$1,845</u> Costs more, but saves CO2
Net Cost over 10 yr	\$3,215	\$3,945
Added Cost		\$730 over 10 years
CO2 (kg) emissions/yr	1,224	0
CO2 (kg) saved/yr		1,224/yr

	PG&E*	PG&E*
	Gas (60% eff.)	Hybrid Electric
Initial \$ after rebates	\$1,200	\$1,800
Fuel (10 yr)	<u>\$2,317</u>	<u>\$2,700</u> Costs more, but saves CO2
Net Cost over 10 yr	\$3,517	\$4,500
Added Cost		\$983 over 10 years
CO2 (kg) emissions/yr	1,224	387
CO2 (kg) saved/yr		837/yr

* Hot water for family of three; spreadsheets available at <http://carbonfreepaloalto.org>

Home Heating Electrification

Efficient Gas Furnace vs Heat Pump

	Palo Alto	PG&E
Heat Pump Cost vs Gas Furnace over life of system	23% more	23% more
CO2 reduction	100% less	81% less

Heat pump offers easier upgrade of AC

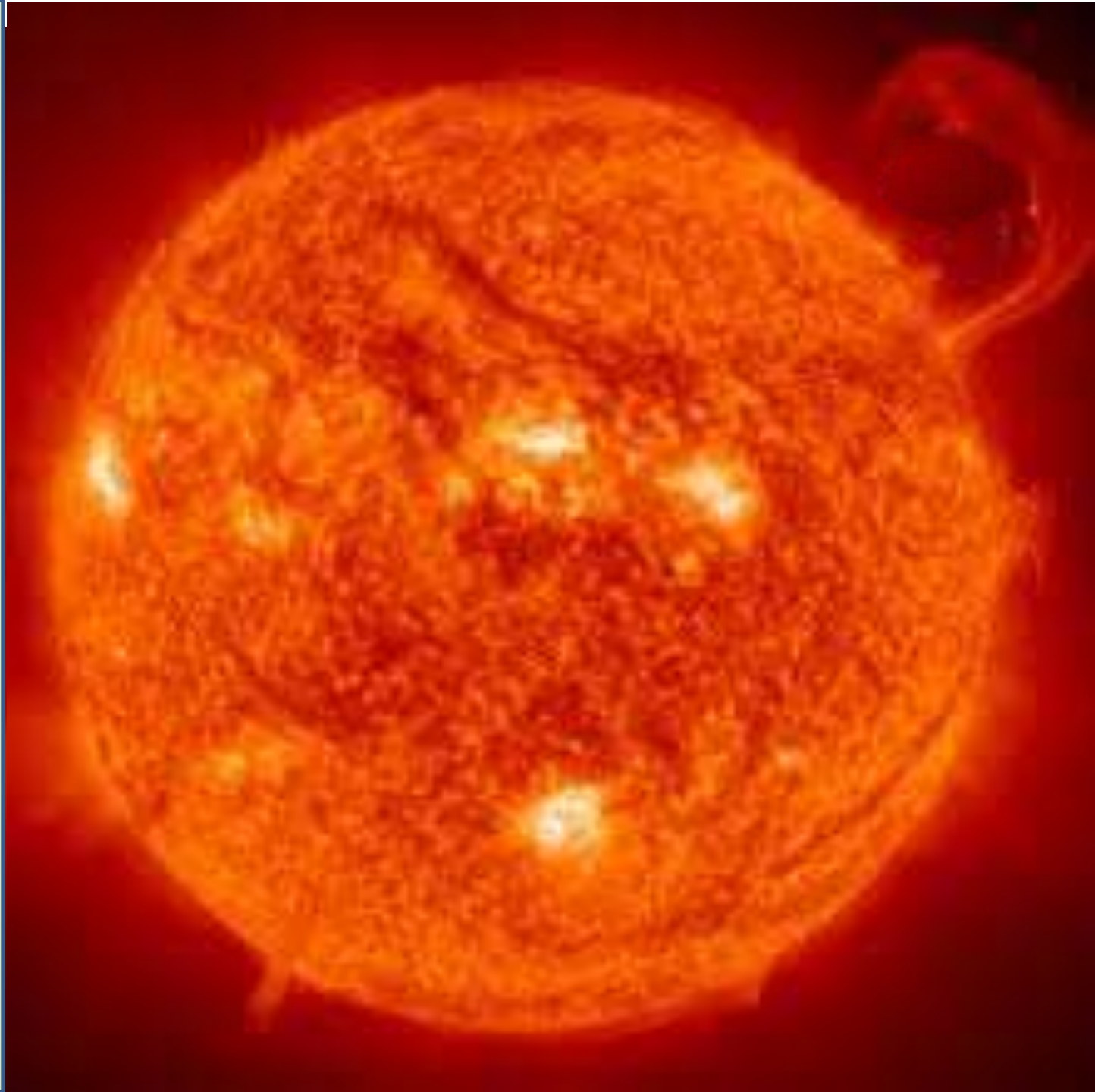
* Spreadsheets available at <http://carbonfreepaloalto.org>

Zero Net Energy Home California Leadership

**In 2020
all new residential construction
in California
will be required to be
Zero Net Energy**

California Energy Commission Goal
supporting AB32

**WE ARE ALL
SOLAR
POWERED**



Free Renewable Solar Energy Delivered Daily



Reasons To Install Solar?

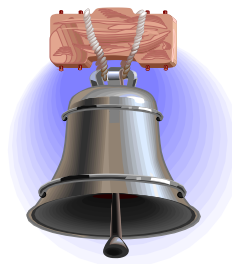
1) Environmental Benefits



2) Economics

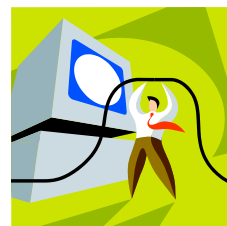


3) Independence



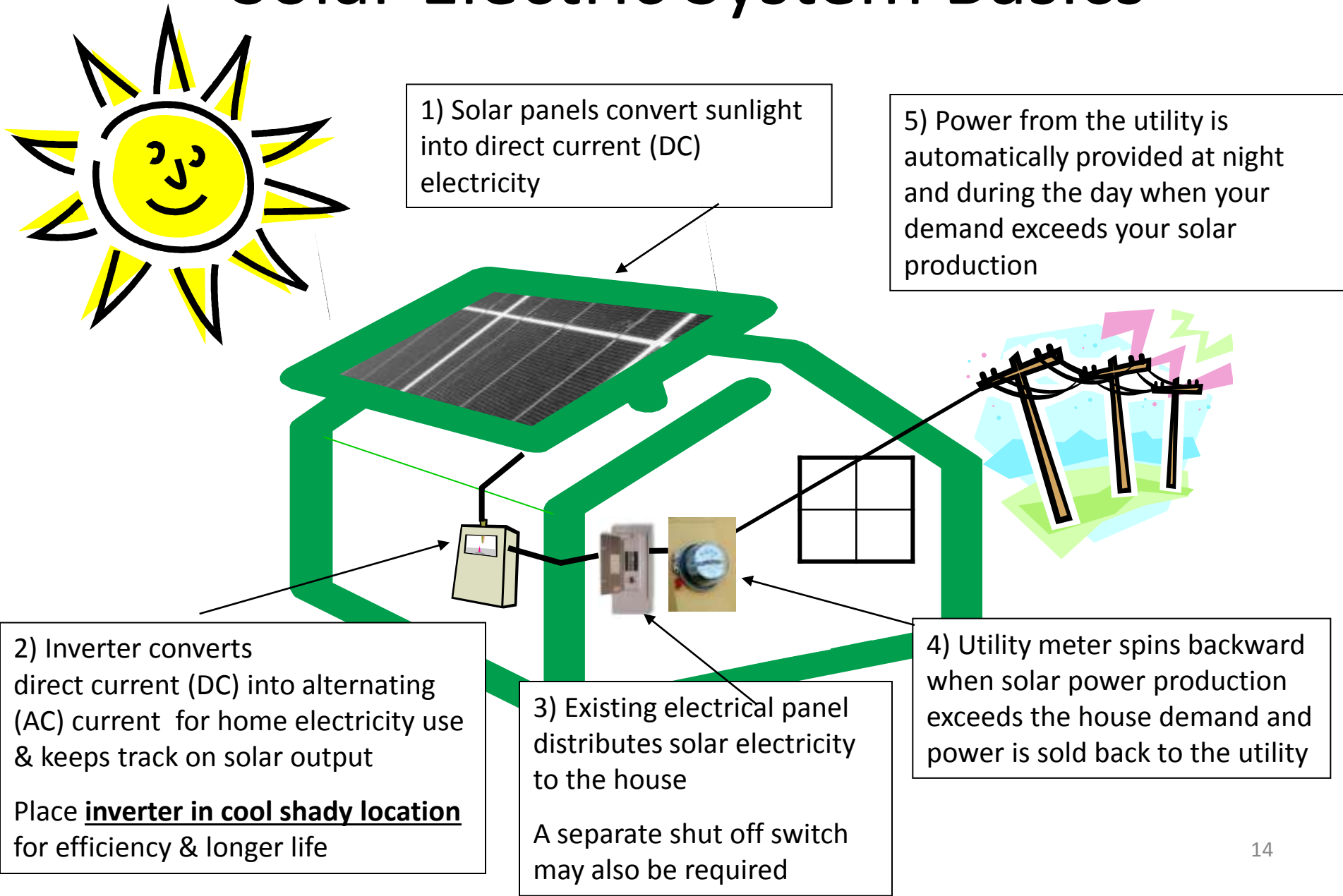
New inverter allows access to energy from solar panels (up to 1500 Watts) when grid is down

4) Technology Interest



Knowing why you want to go solar
will help you make choices and keep the big picture in mind

Solar Electric System Basics



Considerations in Selecting Solar PV

aesthetics, efficiency/space, track record

**Monocrystalline
(Single)**



250 to 320 Watts
Black/blue cell shape

**Polycrystalline
(Multi)**



240 to 300 Watts
Semi-uniform blue color

**Amorphous
(Thin-Film)**



80 to 150 Watts
Uniform black color

← **12-21% efficient** →
50 year track record

8 – 14% efficient
Newer to market
Lower cost
Requires more roof space

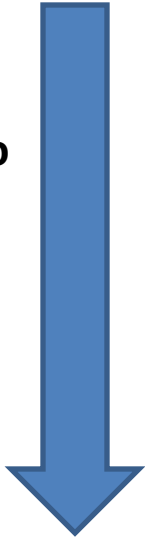
Check SVTC for Environmental Report Card - solarscorecard.com/2013

Roof Condition and Type

Roof should be in good condition

- **15 – 20 year life remaining**
- **Ideal to install solar on new roof**

**More
Expensive to
Install
Solar**



- Composite shingle
- Standing seam metal roof
- Shake if new and not brittle
- Tar and gravel flat (not including tilting)
- Cement tile
- Spanish tile
- Shake if old and brittle

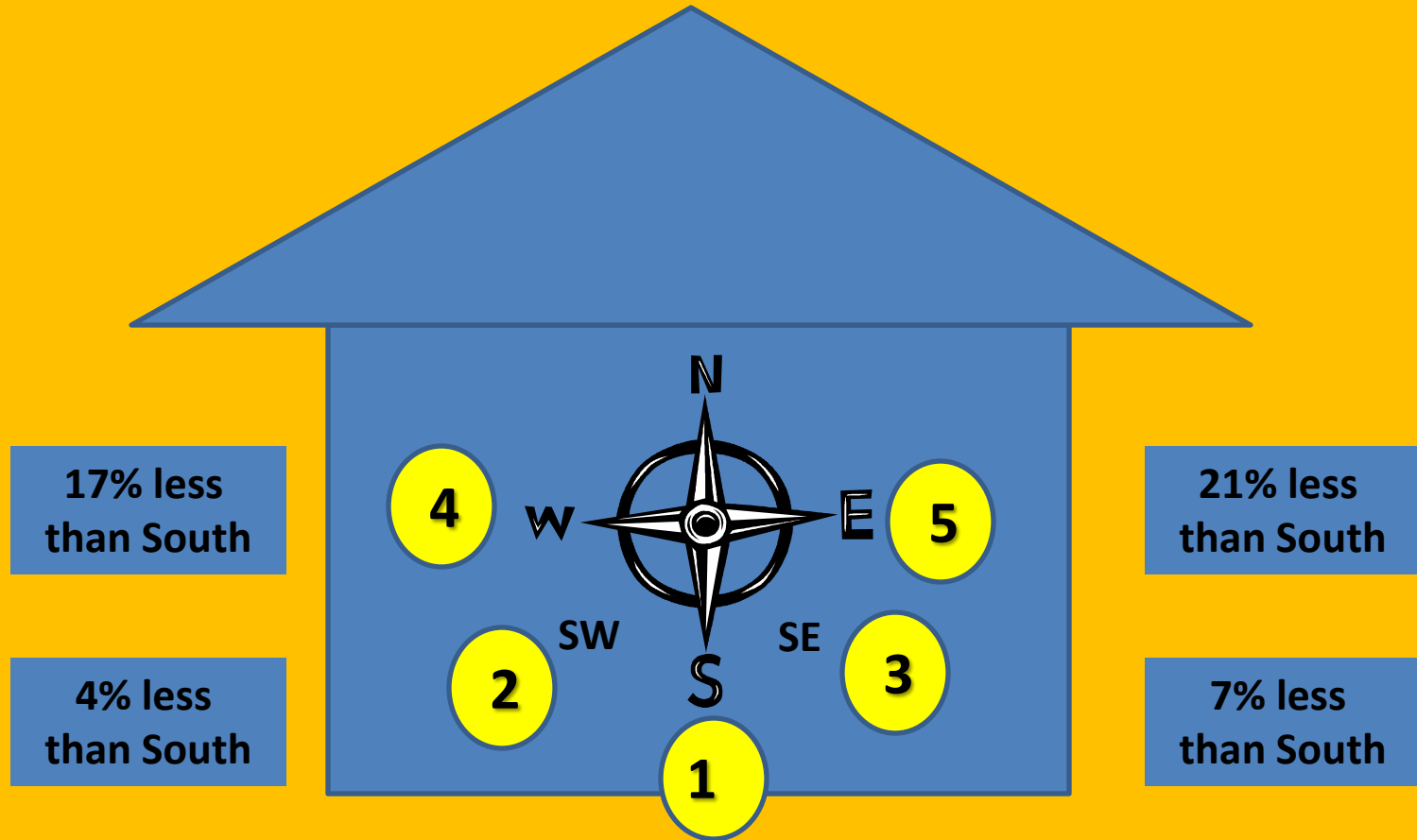
Many contractors will not install on:

- Slate
- Hardie shake



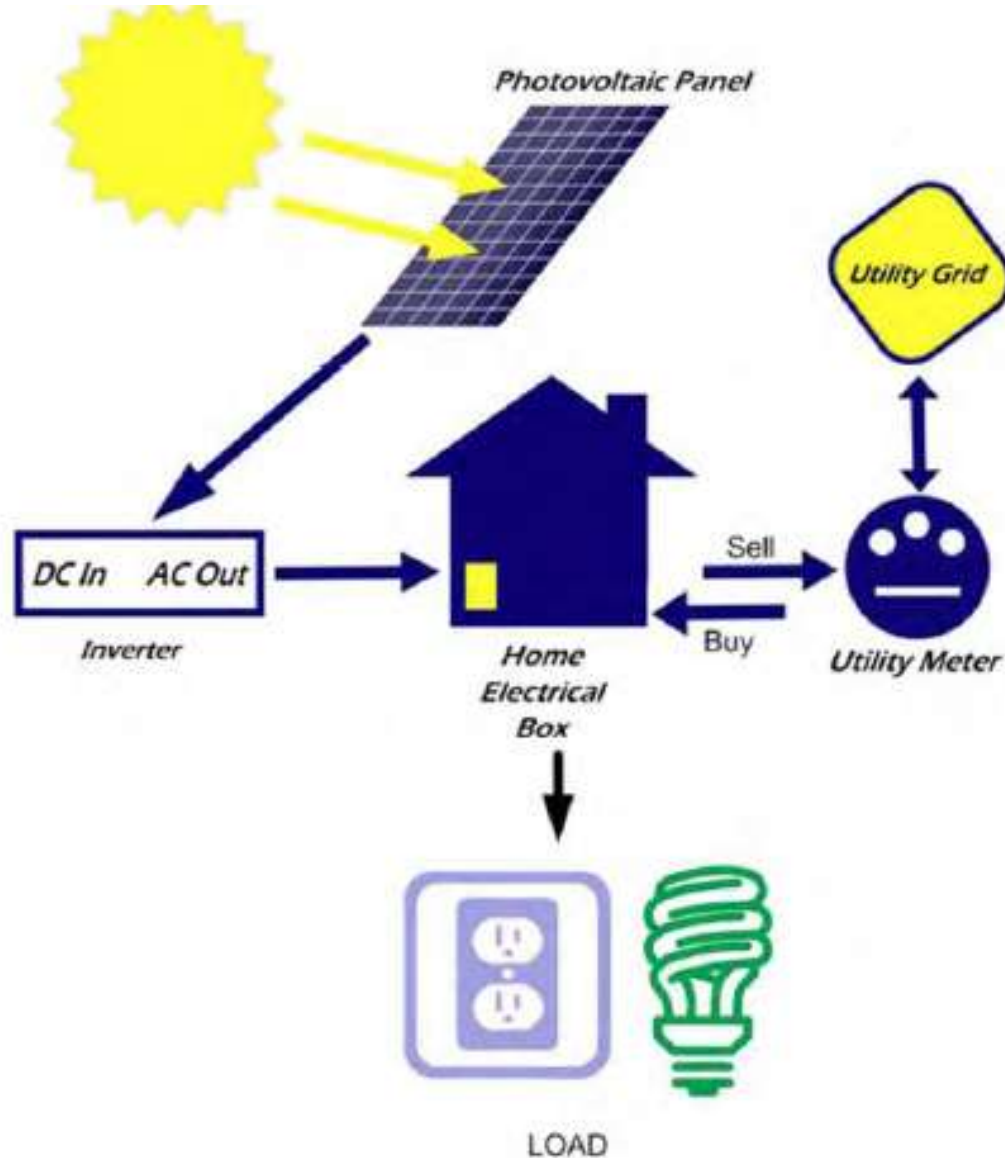
Optimal Roof Direction is South

- many directions work -



Talk to an solar installer about shade issues

Utility Billing for PV Customers



NET METERING

Monthly Billing

- Utility electric meter *only* measures the difference between generation and consumption = net energy
- When monthly electric consumption *EXCEEDS* the amount generated, you pay for the net energy based on retail rates

NET METERING

Monthly Bill Credits

- When monthly electric consumption is LESS than the amount generated, you receive a bill credit based on the same retail rates
- Bill credit can *only* be used to offset future electric consumption charges

NET SURPLUS ELECTRICITY

Annual Settlement

- Definition: If annual kWh generation > annual kWh consumption, the difference
- Every 12 months you have a settlement option
 - Option A: cash out last 12 months of net surplus kWh
Value is based on wholesale net surplus rate (5.841¢/kWh)
 - Option B: continue to carry net metering credits forward
Value is based on full retail rates (9.5-18.9¢/kWh)
- Change your election once a year, but can only cash out last 12 months of surplus electricity

Financial Examples

Electric Bill Averages \$150

Palo Alto Customers

Ave. monthly electric bill	System size kW AC*	Cost after rebate & tax credit	First year savings \$ per year	% of Electricity generated by solar	Payback in years	<u>Tax Free</u> Rate of Return over 25 years
\$150	4.5	\$18,000	\$1,240	59%	12	8%

PG&E Customers

Ave. monthly electric bill	System size kW AC*	Cost after rebate & tax credit	First year savings \$ per year	% of Electricity generated by solar	Payback in years	<u>Tax Free</u> Rate of Return over 25 years
\$150	4.5	\$20,500	\$1,550	86%	12	9%

Based on Clean Power Estimator; www.gosolarcalifornia.ca.gov/tools/clean_power_estimator.php

* Note, this is for kW AC (many installers quote in kW DC which is higher)

Solar Lease/Power Purchase Agreement Can Be Attractive

- Pay set price just for solar energy produced
- Immediate reduction in energy bill (if >\$130/month)
- Benefits
 - Low up front cost (varies from \$0 to \$1000)
 - Company will replace components they fail (Inverter)
 - System monitored – company motivated to improve
 - Annual cleaning may be included
- Potential Issues
 - Can I transfer agreement to another homeowner?
 - Any costs to transfer agreement?
 - Who pays for removal if I reroof?

Solar PV Purchasing Tips

- 1BOG.org (1 Block off the Grid)
 - Sign up for group purchase discount; no obligation
 - No significant geography restrictions
 - Price adders for roof type and technology choices
- Check for discounts from your employer or credit union
 - Example, discounts for HP, Google, San Jose city employees
- Check contractor license and BBB rating
- Keep the big picture in mind – why am I doing this 😊

Option for Low Electricity Using Homes

Sunwork.org – non profit

- Customers with low electricity bill
 - *averaging less than \$130/mo*
- Trained volunteers
- Also Installations for other non profits (e.g. Rebuilding Together – Redwood City)

Benefits

- Faster payback (15% to 30%)
- Provides hands on experience for future green collar workers



SunWork Volunteer Training for Solar Installation

- Two dates Nov 23 & 24
- 3 hours
- In Palo Alto
- Electrical theory
- Solar power basics
- Construction safety and best practices
- Email interest to info@SunWork.org





Acterra

ACTION FOR A SUSTAINABLE EARTH

Green@Home: A free energy-saving program for Palo Alto residents

Debbie Mytels

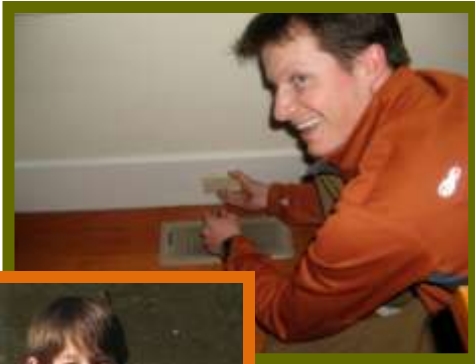
Associate Director, Acterra

debbiem@acterra.org



About Acterra

43 year old, Palo Alto non-profit



- Bringing people together to create local solutions for a healthy planet



- Creating opportunities for ordinary people to make a difference

“If it ain’t fun, it don’t get done!”



Acterra

How Green@Home Works

- Trained volunteers make scheduled visit to your home
- Free to all Palo Alto residents ONLY
- Install basic energy-saving devices
- Sign up on-line at www.acterra.org/green@home
Or call Lisa at (650) 962-9876 x350
- Volunteers Wanted:
 - Next training: October 29 & Nov. 5



Acterra

Volunteers Do Basic Tasks & Educate



CFLs



Water
Temperature



Showerhead



Faucet
Aerators



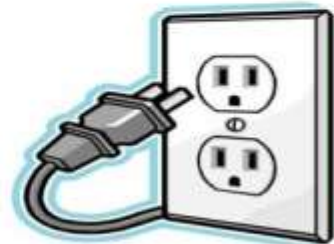
Refrigerator
Temperature



Clothesline



Door
Weatherstripping



Outlet gasket



Acterra

Additional HouseCall Actions

- Review utility bill
- Energy Audit: Measure energy usage throughout house and identify ways to save
- Suggest additional devices to install or conservation habits to adopt
- Receive packet of info about community resources
- Create customized energy saving plan
- Yard sign to show participation



Energy Upgrade Mountain View

- Free, City-sponsored program
- Provides an on-line diagnosis of where your home energy goes
- You get customized recommendations on how to save at YOUR home
- Phone support and home visits if needed
- Sign up at www.energyupgrademv.org
- Next public workshop: October 10, 7:00 pm MV City Hall



After You Sign Up for EUMV Energy Upgrade Mountain View

- Your Home Energy Profile
On your EUMV home page
- Monthly email updates →
- Track your energy use over time

energy upgrade
CALIFORNIA

Mountain View

Dear John Smith,
Your monthly bill has arrived for April.

In the past month, you used XXX kWh of electricity and YYY therms of natural gas. Of course there are lots of reasons for changes in the short term. What is your long term trajectory for total energy use?

Most homes have electronics and appliances that are continuously consuming electricity. Lowering this one number has a big impact on your overall energy cost. How has it changed?

Metric	Value	Change
Annual Energy Cost	\$1,200	↓ 1.5% since you registered
Home Idle Load	340 Watts	↑ 2.5% since you registered

Note: Annual Energy Cost is your household's energy cost in the past 12 months. Home Idle Load is the amount of electricity your home consumes every hour of every day, even when you think everything is off.

Each month, when your new PG&E bill becomes available, you will receive a message from us showing how your energy use is changing. Use this information to understand the impact of energy saving steps you've taken. The goal is to bring energy use down and keep it lower. Small, lasting changes can have a big impact.

Send feedback to support@HighEnergyAudits.com

People in Mountain View Conserve Energy.



Silicon Valley Energy Watch

An Acterra program for the rest of Santa Clara County – need to have PG&E SmartMeter

Starts Nov. 1

- On-line diagnosis of YOUR home energy waste
- Customized recommendations

Phone support and home visits for those with high potential for savings

Contact Lisa Dorn to sign up:

lisad@acterra.org

Lindsay Joye, P.E., Marketing Engineer

- Energy conservation and solar programs
- Rebates and incentives
- EcoHome

REBATES AVAILABLE



Residential Energy
Assistance Program
(REAP) 

Refrigerator
Recycling 

Free Water Saving
Devices 

Water-Wise House
Call Program 

Landscape Rebates

High-Efficiency Clothes
Washer Rebates 

High-Efficiency
Toilet (HET) Rebates

Appliance Rebates

Power Strips

Attic and Wall
Insulation

Solar Attic Fans

Water Heaters

Heating and
Air Conditioning

Pool Pumps

Solar Water
Heating Program

Renovation & New
Construction Rebate
Program

PV Partners Program



Suitable for Renters

For More Information

Visit www.cityofpaloalto.org/utilities
or call **(650) 329-2241** for assistance.

To qualify for the Landscape Rebate Program, you **must participate in a Water-Wise House Call** and receive a written Notice to Proceed prior to beginning your landscape project. To schedule a Water-Wise House Call, sign up online at www.valleywater.org or call (800) 548-1882.

EcoHome

Date: Saturday, October 5

Time: 10 am - 3 pm

Located next to the Girl Scout House, behind the Lucie Stern Community Center.



EcoHome

Located next to the Girl Scout House, behind the Lucie Stern Community Center.



INTRODUCING THE EcoHome

SOLAR PANELS on the top of a roof can capture energy from the sun for use in your home. This energy is clean and plentiful.



An **ENERGY-STAR®** refrigerator uses 20% less energy than a non-Energy-Star one.



Using a **LOW-FLOW TOILET AND SHOWER HEAD** can save a lot of water. A five minute shower uses 10-25 gallons of water. A bath on the other hand can use more than 70 gallons! A leaky toilet can waste more than 200 gallons a day. That's a LOT of wasted flushes!



Use a **RAIN BARREL** to save water for gardening drought resistant plants.

A one-inch rainstorm can produce up to 700 gallons of water off of a typical roof, which in turn you can use to water your garden at a later date. Also, native plant landscaping serves about 1/2 of the water use.



Fish don't like to swim in **FATS, OILS, OR GREASE**. By keeping a small jar or can near your sink you can keep fats/oils/grease out of the waterways, and when it's full you can just throw it in the garbage.



An **ENERGY EFFICIENT HEAT PUMP** works like a refrigerator, but in reverse. It turns cold air into hot air for your home.



DID YOU KNOW old jeans can be made into highly efficient insulation? It's true, and recycled denim insulation doesn't itch like fiberglass insulation.



By sorting your waste into **RECYCLING, COMPOST AND TRASH**, you can keep much of your waste from going into landfills.



Did you know that the best way to save money on heating and cooling costs is to install insulation in the attic?



DOUBLE PANED ARGON FILLED WINDOWS use dense Argon gas to slow the loss of heat in the winter and keep the heat out in the summer.



LED AND CFL LIGHTS use up to 75% less energy and can last up to 10 times longer than an incandescent light bulb. If you add it to a motion sensor outside, they'll last even longer!



Did you know your TV uses energy even when it's not on? This is called a **"VAMPIRE LOAD."** By turning off your outlets and switches you can stop electronics from sucking energy when not in use.



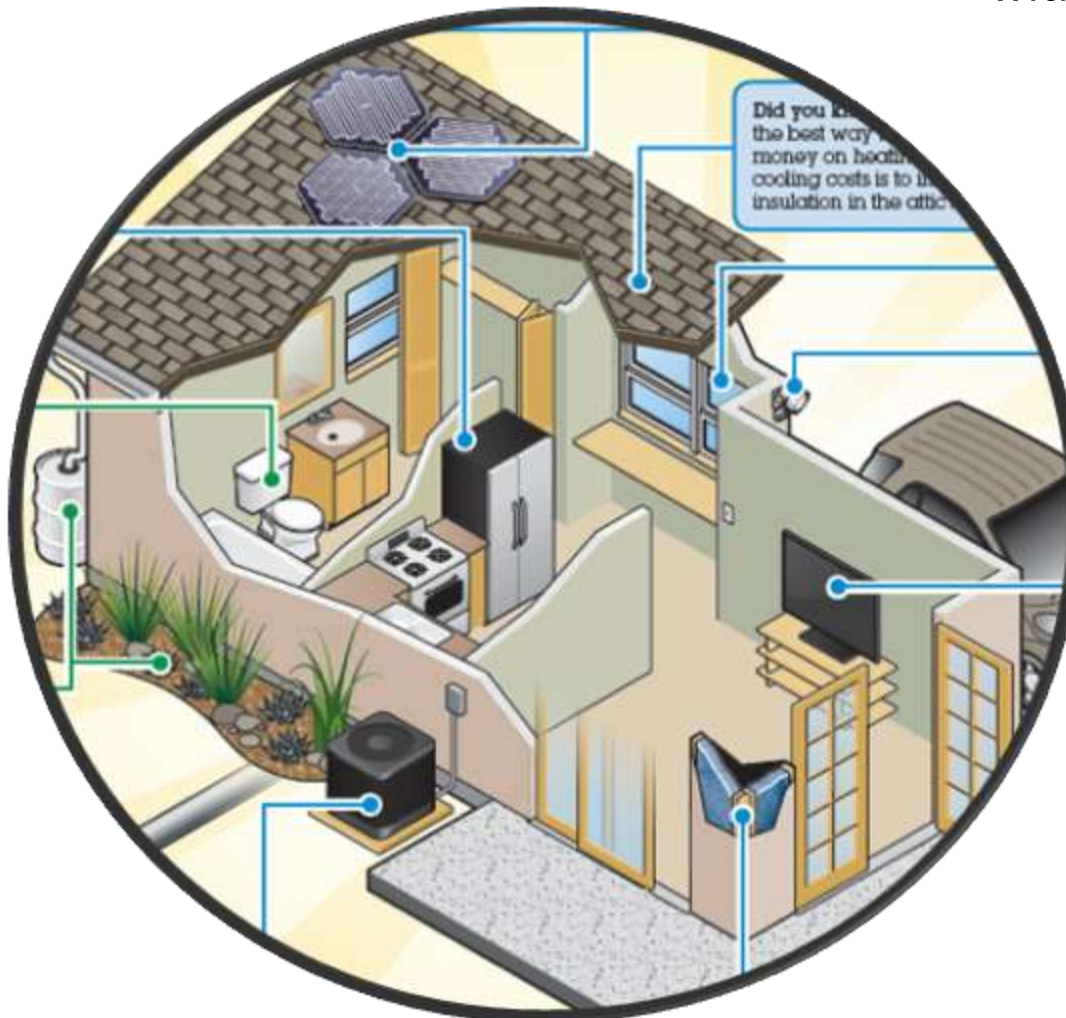
Electric Vehicles can save money on fuel. Even more important, the electricity used to power these cars comes from primarily renewable and clean sources in Palo Alto—much better on the environment than a traditional car.



There are so many ways to make your home more sustainable. The City of Palo Alto can work with you and your family or school group to help and provide information. Find out more on the other side of this map!

EcoHome

Project ideas are categorized into 3 levels of effort: Simple, Moderate or Significant steps, with costs and savings listed for comparison



Heating, Ventilation and Air Conditioning Systems

Even in Palo Alto, heating and air conditioning can make up more than 25% of your home's energy costs. Leaky ducts can cause 20% or more of the conditioned air (heated or cooled) to escape before it reaches you. They are also a source of indoor air pollution. Heating, Ventilation, and Air Conditioning (HVAC) strongly impact our comfort, our health and our utility bills.



Significant Changes



An energy efficient heat pump has been installed rather than a traditional furnace. New ductwork has been installed throughout the house with proper sealing and insulation.

HVAC Savings

FAMILY	EFFICIENCY MEASURE	MEASURE COST	ANNUAL SAVINGS
Full Retrofit	Heat pump	\$555	\$245
	Duct work	\$555	\$200
	Total		\$445

\$ 1-25 \$5 26-100 \$55 101-300 \$555 Over \$300

Moderate Steps



The family installed a programmable thermostat with multiple zones so that each area of the house is comfortable. They know that they can only get energy savings and reductions from the utilities bill if they set temperatures down in the winter and up in the summer, especially at night and when they

are gone. The ducts in the crawl space under the house were sealed and insulated to reduce heat loss.

HVAC Savings

FAMILY	EFFICIENCY MEASURE	MEASURE COST	ANNUAL SAVINGS
Market Upgrade	Programmable thermostat	\$0	\$125
	Ducts sealed and insulated	\$5	\$100
	Total		\$225

\$ 1-25 \$5 26-100 \$55 101-300 \$555 Over \$300

Simple Steps



They now set the thermostat to 68°F in the winter and 86°F in the summer to reduce energy use. They change the filters on a regular basis to let the furnace function efficiently and to remove allergens.

HVAC Savings

FAMILY	EFFICIENCY MEASURE	MEASURE COST	ANNUAL SAVINGS
Least Cost	Setting the thermostat	\$0.00	\$150
	Filters	\$	\$10
	Total		\$160

\$ 1-25 \$5 26-100 \$55 101-300 \$555 Over \$300

Contact us for more information at (650) 329-2241 or www.cityofpaloalto.org/SustainableHome





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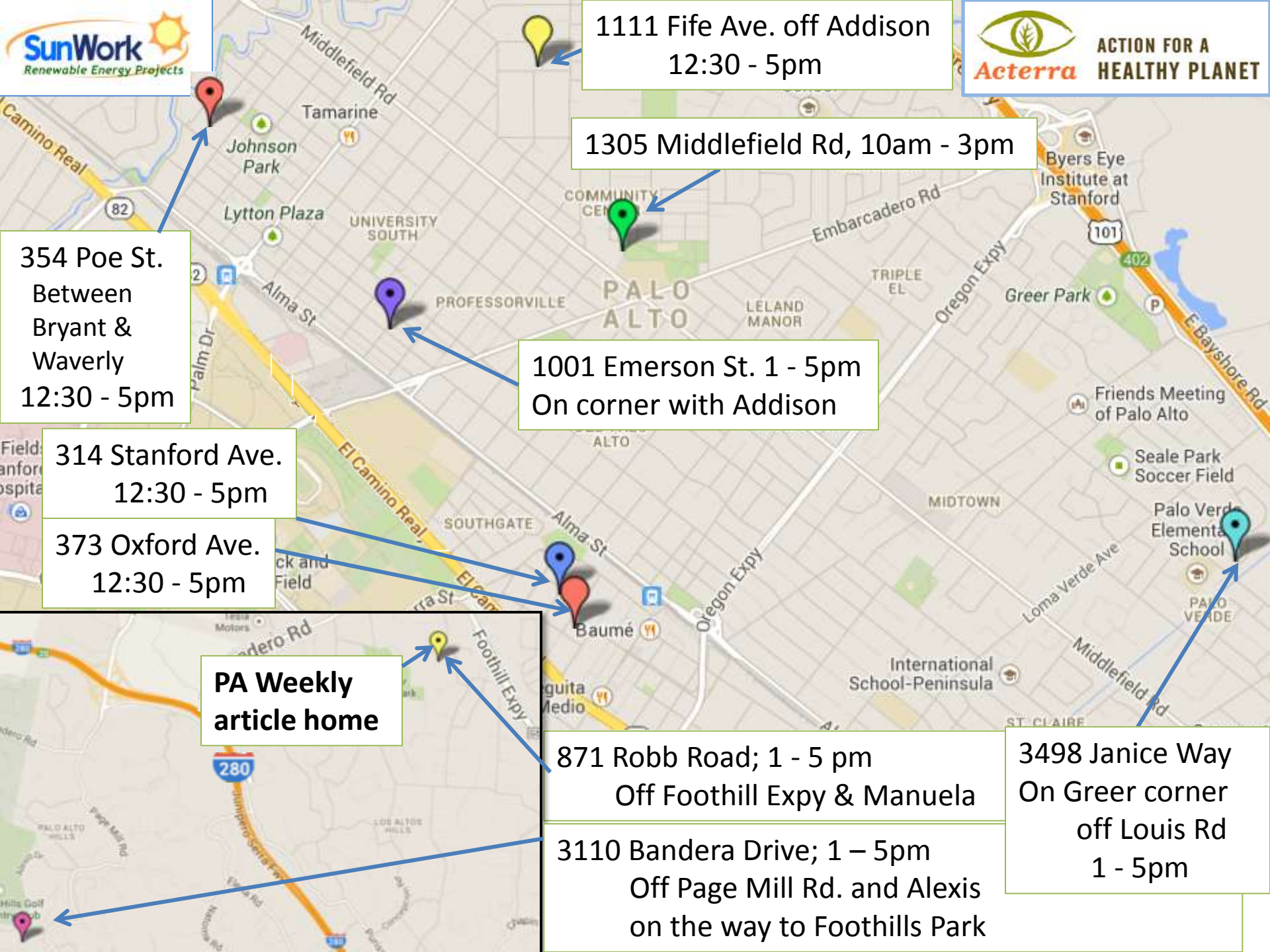
[MAP: goo.gl/maps/HCE2C](http://goo.gl/maps/HCE2C)

Solar Homes Tour

The Road to Zero-Net Energy

(Homes open 1 to 5pm, unless noted)

<u>MAP:</u> goo.gl/maps/HCE2C	Solar PV	Solar Hot Water	Passive House Design	Heat Pump	Heat Recovery (HRV)	Water Efficiency	E V	Other features
EcoHome, 10 am-3 pm 1305 Middlefield	X			X		Rainwater harvest	X	<ul style="list-style-type: none"> • Recycled counters • Blue jean insulation
354 Poe Street, 12:30 (new) <i>Net zero energy – all electric</i>	17.6 kW		X	X	X	Greywater Rainwater		<ul style="list-style-type: none"> • Radiant heat/cool ceilings
314 Stanford Ave, 12:30 <i>Net zero energy – all electric</i>	4.2 kW		X	X	X	Indoor grey water	X	<ul style="list-style-type: none"> • EV curbside charger • Green garden
373 Oxford Ave, 12:30 (new) Magic community	14 kW	X + Hybrid	X	Mini-Split	X			<ul style="list-style-type: none"> • Tight, super insulated envelope
1111 Fife Ave, 12:30 Outside Only	4 kW						X	<ul style="list-style-type: none"> • SunWork PV install • Tesla; Fiat EV, LEDs
1001 Emerson St. • Outside & main room	3.5 kW	X passive				Greywater irrigation		<ul style="list-style-type: none"> • Green construction • Radiant heating
3498 Janice Way (outside) <i>Net zero energy; electric+EV</i>	6 kW	in process					X	<ul style="list-style-type: none"> • Energy monitor • PV flexible design
871 Robb Ave (new) <i>Net zero energy – all electric</i>	5.8 kW	X active	X	X	X	X	X	<ul style="list-style-type: none"> • Radiant heat/cool • Exterior shading
3110 Bandera Dr. (outside) <i>Net zero energy; electric+EV (long steep driveway)</i>	6.9 kW	X passive				Rain catch plan -100% irrigation	X	<ul style="list-style-type: none"> • Tesla long distance charging experience • High eff gas furnace



1111 Fife Ave. off Addison
12:30 - 5pm

1305 Middlefield Rd, 10am - 3pm

354 Poe St.
Between
Bryant &
Waverly
12:30 - 5pm

1001 Emerson St. 1 - 5pm
On corner with Addison

314 Stanford Ave.
12:30 - 5pm

373 Oxford Ave.
12:30 - 5pm

PA Weekly
article home

871 Robb Road; 1 - 5 pm
Off Foothill Expy & Manuela

3110 Bandera Drive; 1 - 5pm
Off Page Mill Rd. and Alexis
on the way to Foothills Park

3498 Janice Way
On Greer corner
off Louis Rd
1 - 5pm

3110 Bandera Dr. - Solar Homes Tour

(near Foothill Park, steep driveway)



ProgressiveTube passive solar hot water system
40 gallon integrated collector system
- no moving parts -

- 6.9 kW Solar PV
covering 100% of
electricity needs
including Tesla EV



Rainwater harvesting – 50 & 300 gallon
Plans for 1500 gallon storage covering
100% of irrigation needs



871 Robb Road – 2013 Solar Homes Tour

Passive Home – Zero-Net Energy including EV



Active Solar Hot Water panels - tank and control system (below)



- Passive design with intelligent overhangs & house placement
- 20 panels, 5.8 kW (DC) Solar PV using SunPower panels
- Thermionic heat pump with efficient radiant heating & cooling (no gas used) →
- Heat recovery ventilator (HRV) ← provides fresh air & improved climate control, while saving energy
- Arkin Tilt Architects



3498 Janice Way – 2013 Solar Homes Tour



TED energy monitor shows energy usage by electric circuit in real time, remotely

- 6 kW (DC) Solar PV using 25 US made Sharp panels on flat roof covering 100% of electrical needs including EV (Leaf)
- SolarEdge DC Optimizers improve energy production during shading; PV designed for flexible expansion
- Copperheart passive solar hot water system with Integrated Collector Storage (ICS)



1001 Emerson Ave – Solar Homes Tour



- Green Building Materials

- ❖ Bamboo flooring
- ❖ Flyash concrete
- ❖ FSC Certified decking & siding
- ❖ Recycled carpet
- ❖ Recycled glass tile
- ❖ Recycled demolition waste

- 3.6 kW Solar PV

- Grey water recycling system
- Hydronic radiant heating

1111 Fife Ave – 2013 Solar Homes Tour

Open 12:30 to 5pm



Enphase monitoring tracks energy production from each panel



Electric Fiat 500e

- 4 kW (DC) Solar PV using 16 REC panels installed by SunWork, it covers 100% of electrical needs excluding EVs (Telsa & Fiat)
- Micro-inverters improve energy production when shaded
- SolarTube and skylights for indoor lighting



373 Oxford Ave – Magic House

Passive House – Zero Net Energy

Open 12:30 to 5pm



- 15 kW Solar PV
- Solar hot water
- SolaTubes & skylights
- Heat pump heating & cooling
- HRV
- Use of thermal mass
- Reclaimed wood/brick

Insulated Concrete Formed walls (ICF) for massive, airtight, super insulated envelope & reduced thermal bridging

Some construction in progress



314 Stanford Ave - Project Green Home

Adventures in Deep Energy Efficiency

Beyond Platinum LEED, Zero Net Energy & Passive Home

- 5.9 kW PV system for ZNE & 8,000 miles of Electric Vehicle (EV) driving
- Ultra, ultra low flow toilets
- Nation's 1st residential curbside EV charger & EV Rides (BMW & Leaf)
- CA's 1st kitchen sink greywater system
- Inductive stove & uber-insulation





354 Poe Street - Passive House

Open 12:30 to 5pm

Solar Panels

- 17.6 kW on all roof surfaces

Recycled Materials

- Bricks from Stanford

Greywater Recycling

Rainwater Harvesting



Sealed Tight

- Heat Recovery Ventilator (HRV) for fresh air

Super Insulated

- Including basement and

Control Openings

- Passive-House rated frames & 3 pane windows

Keep it Dry

- "Rainscreen fabric" allows moisture to exit

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IMAGE: © FGY ARCHITECTS, PALO ALTO, CALIFORNIA

Some construction in progress
Ferguson Garber Young Architects

Tips for the Tour

- Pick your homes based on the features of interest
- Note - some homes are open outside only
- Check open times on the homes
- May be smart to start with homes further away to avoid crowds

Ride and Drive an EV

- In front of Lucie Stern
- And at Stanford Ave. home



Thanks to Co-Sponsors

- City of Palo Alto Utilities
 - Electric Auto Association of Silicon Valley
 - Loma Prieta Chapter of the Sierra Club
 - Lorna Fear, Visual Cue Thermal Imaging
 - American Solar Energy Society
 - NorCal Solar Association
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- Slides at SunWork.org &
Acterra.org next week



ENJOY THE TOUR

ON THE ROAD TO ZERO-NET ENERGY

