



Using Solar Energy: A Hot Technology That's Cool



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MASTER BUILDERS ASSOCIATION

solaripedia



Da Vinci?

Solar Energy



Photo: Solar Impulse

Types of Solar

Active and Passive

- **Solar Power** – photovoltaics, PVs, solar panels, solar arrays that generate electricity
- **Solar Thermal** – using the sun's energy to heat something like water
- **Passive Solar** – using the sun's energy to heat or cool buildings without mechanical or electrical systems
- **Solar Concentrating Power (CSP)** – usually large scale applications on utility scale

Photovoltaic Systems (PVs)



Building Integrated Photovoltaics



Photo: Atlantech Solar



Photo: Matrix Energy

Off-Grid and Grid-Tied

Off-Grid Solar System

With Grid-Tied Option

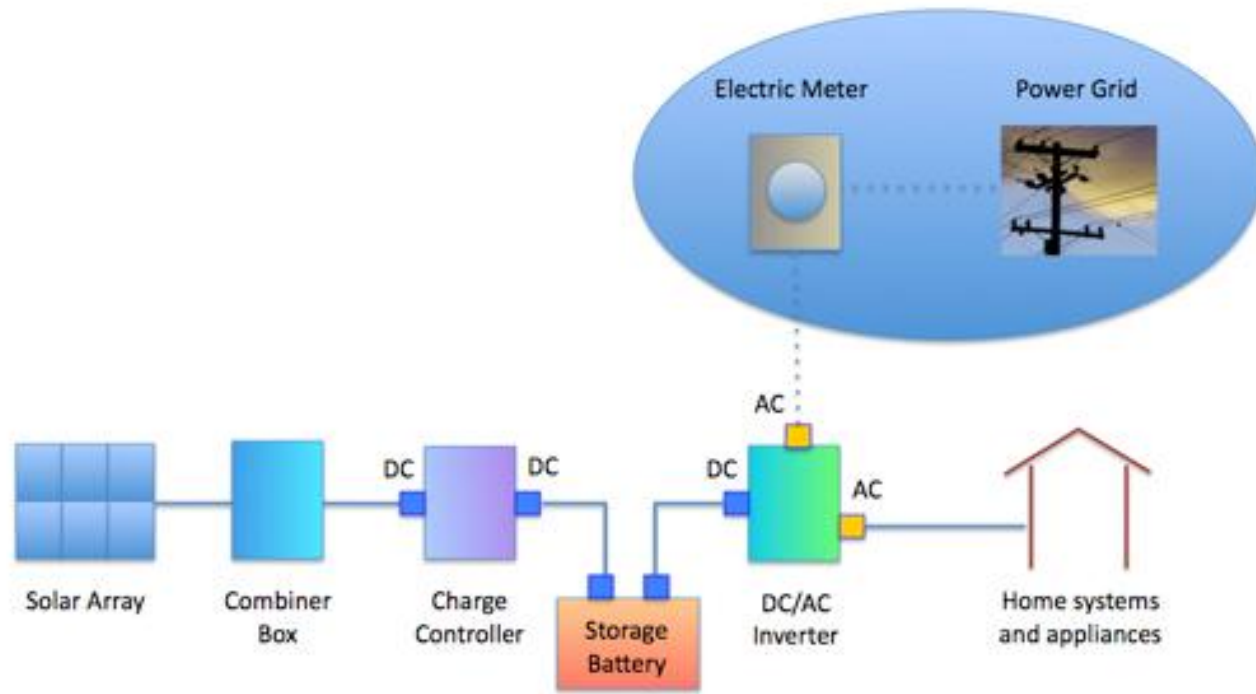
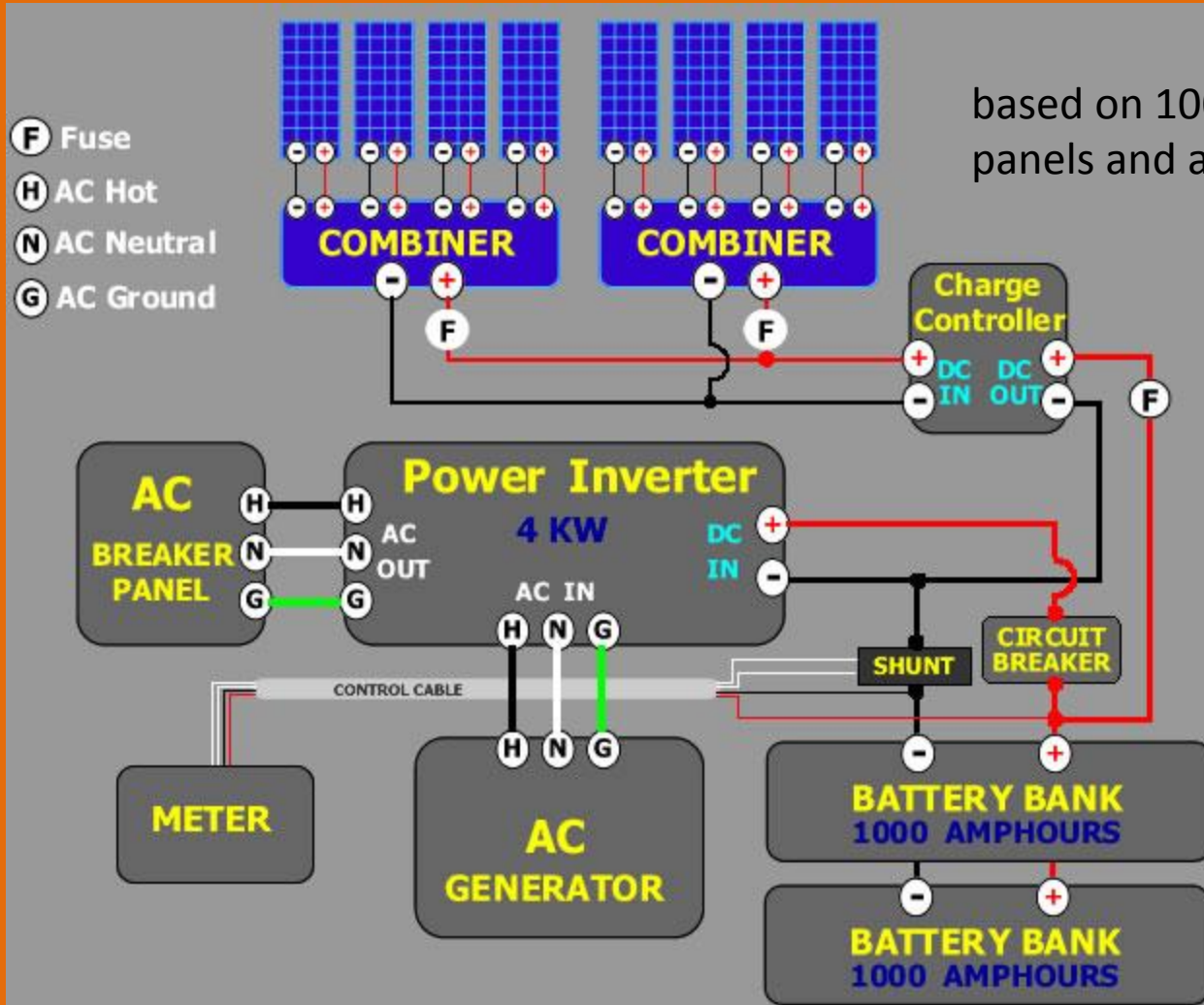


Image: Off The Grid

Off-Grid Schematic



based on 100 watt solar panels and a 5 hour solar day.

Smaller Applications



Photo: Silicon Solar

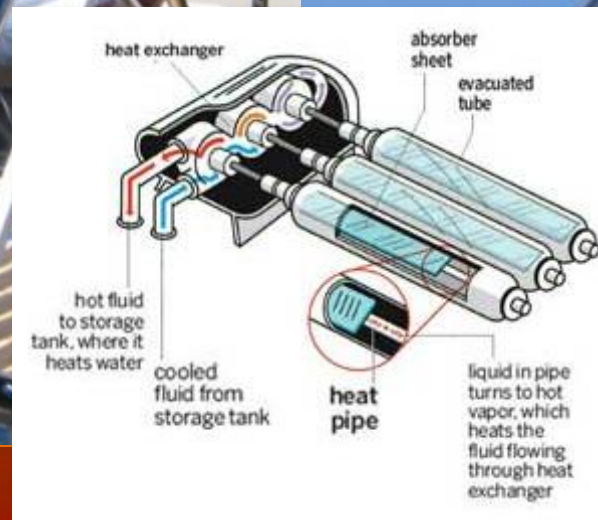
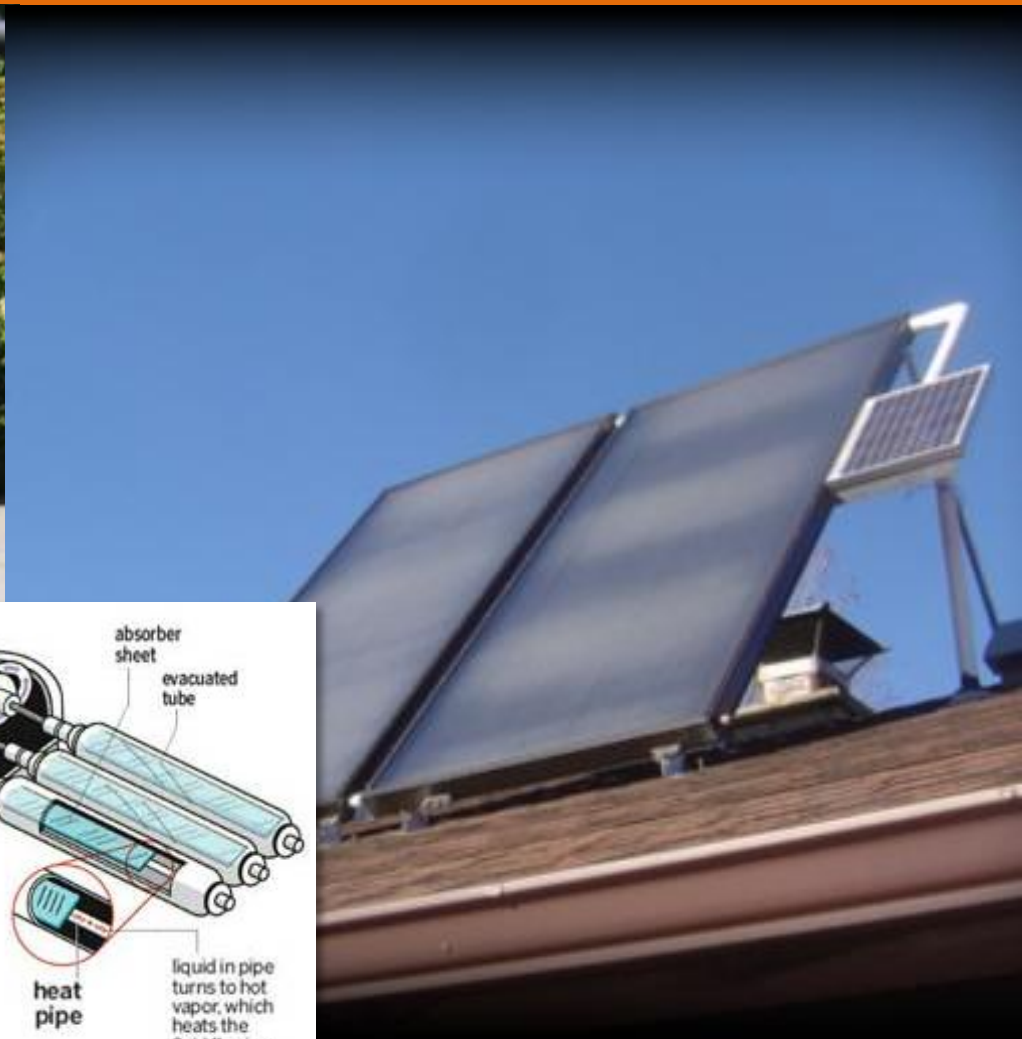


Photo: SolarStar

Concentrating Solar Power

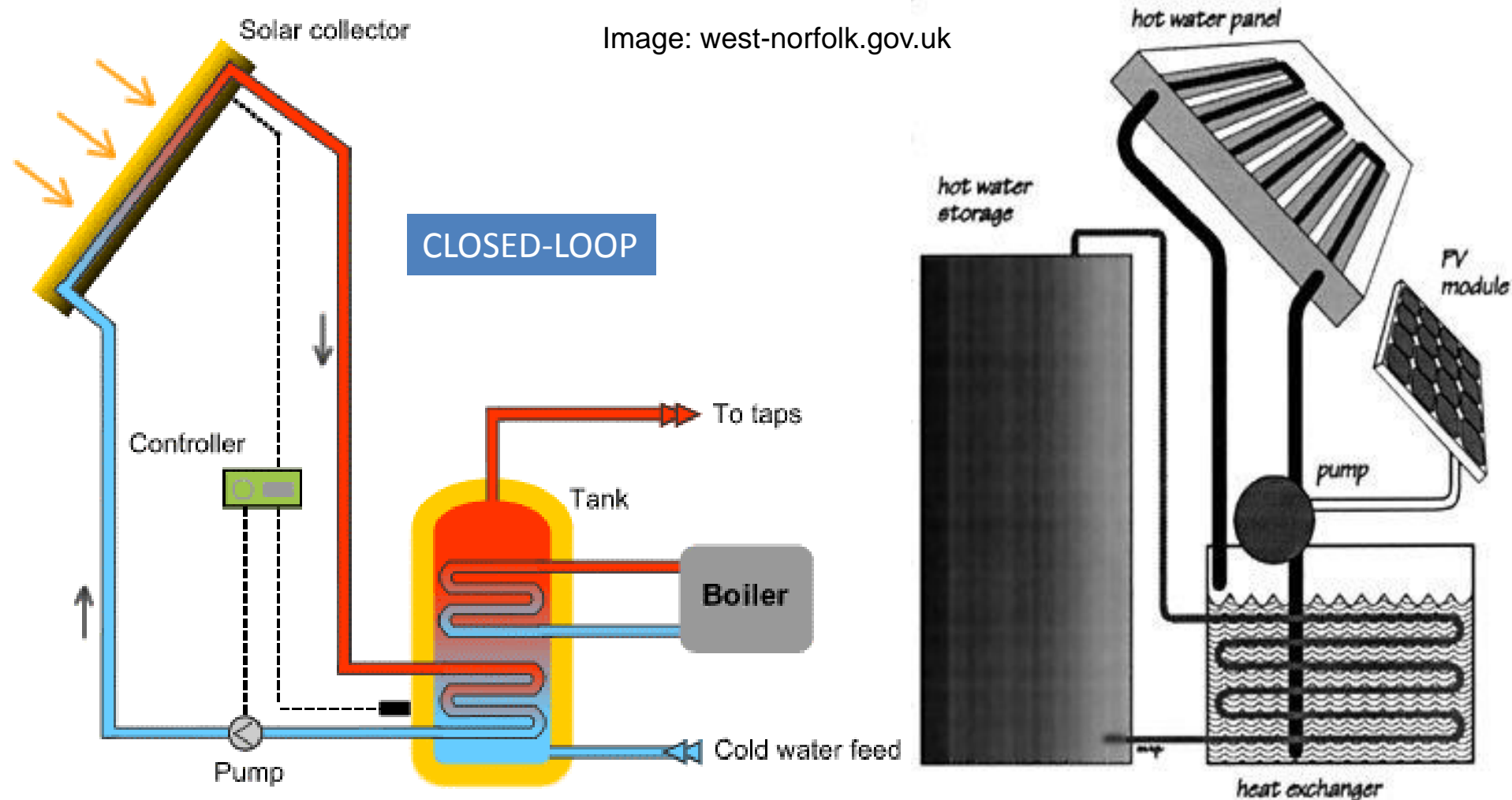


Solar Thermal Systems

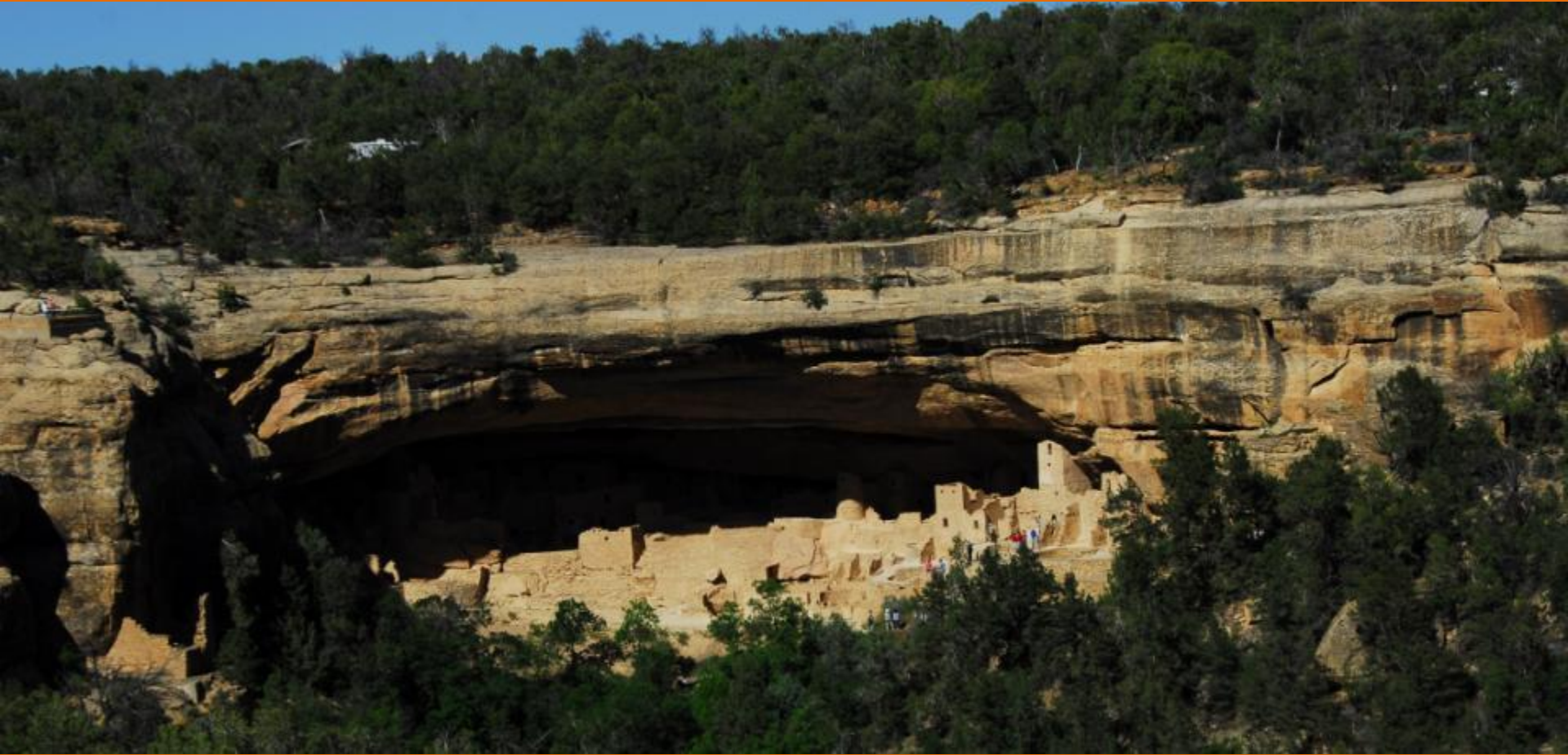


Solar Hot Water

Image: west-norfolk.gov.uk



Passive Solar Design



Swimming Pools & Cooking



Photo: Solar Cooking Wiki



Photo: Solar Sun Rings

Designing for Solar



Energy Saving Basics

- Improve the envelope – first line of defense
 - Insulation, windows, air/vapor sealing, siding
- Reduce energy consumption inside
 - Appliances, furnace, water heater, lighting

Phase the Work

- ➡ Energy audit
- ➡ Seal ducts and clean ducts, furnace
- ➡ Improve insulation in easy spaces
- ➡ Replace windows
- ➡ Replace furnace/water heater
- ➡ ...Renewable energy such as PV

Infrared Scan



- Shows major air leaks throughout house, especially where there's poor insulation



Immediate Payback, Low Cost

- Insulate water heater – 10% savings
- Seal ducts – 30% savings
- Replace dishwasher – 25% energy (+800 gpy water savings)
- Replace lights with CFL or reduce bulb wattage – 66% energy savings – *lighting is ~10% of electric bills*
- Programmable thermostat – pays for itself 1st yr
- Lower water heater to 120 degrees – 10% savings over 140 degrees



Moderate Effort & Cost

- Replace windows – 15% energy savings
- Upgrade insulation – 20-50% energy savings
- Replace water heater – 32% ROI (\$4/mo)
- Replace furnace
- Seal air leaks – 25% reduction
- Solar attic fan and garden path lights
- Replace clothes washer – 50% less energy

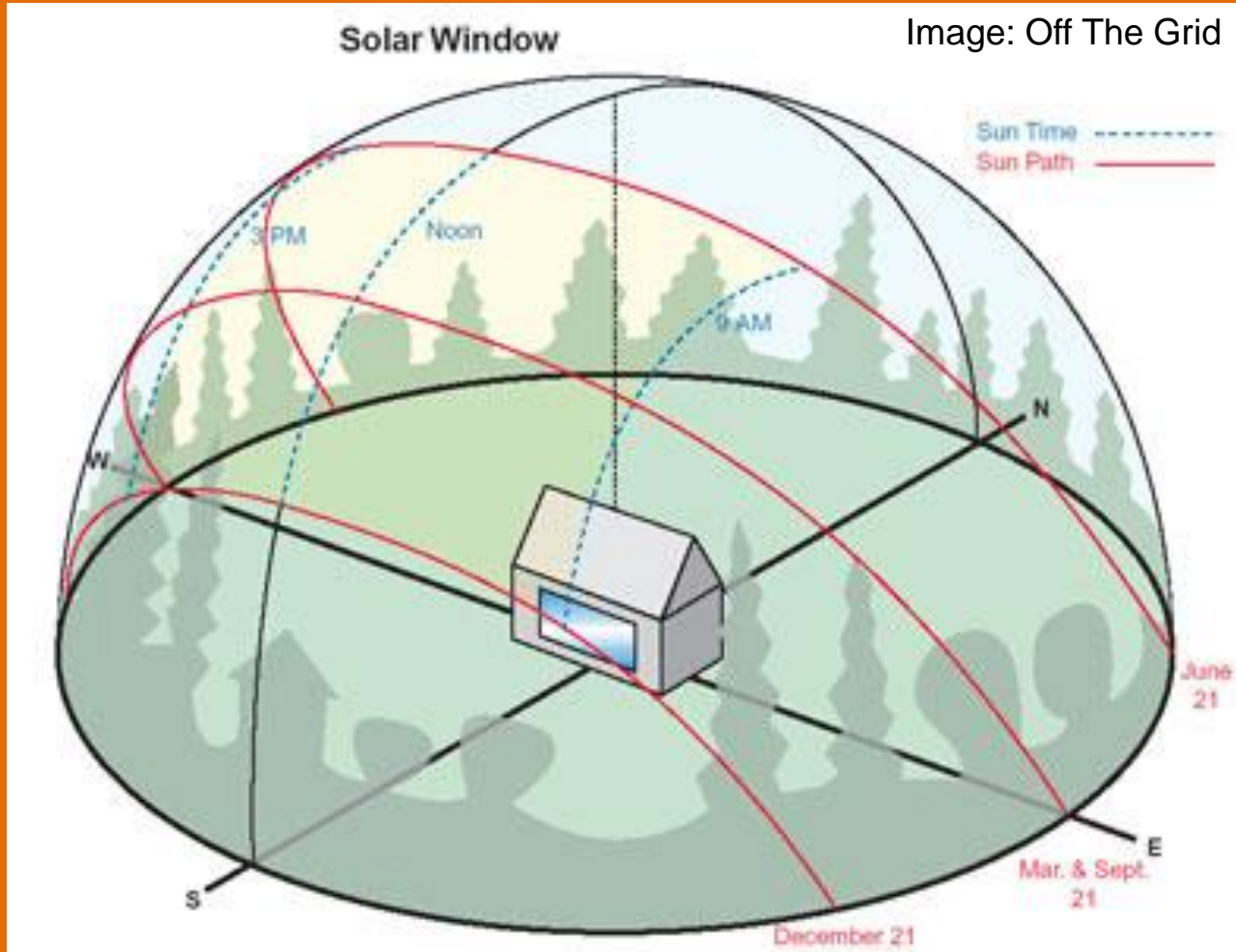


Advanced Reach & Cost

- Radiant floor heat
- Overhangs added on south, west
- Solar water heater
- Geothermal heat
- Upgraded roof or vegetated roof
- Photovoltaics or wind generator
- Passive – thermal mass floors
- Vestibule to temper



Sun's Movement



Site Evaluation

- Size and orientation of roof (or yard)
- Measure amount of sun falling on site if intended solar panels (shade from trees, buildings)



Site and Landscaping



Solar Retrofit Considerations



Passive Solar



Passive Solar Design



Using Natural Light - Daylighting



Skylights & Lightwells



Solatubes or Light Tubes



Pre-Wire for Solar



Solar Power Components

To provide common 120 volt AC power for daily use:

- Solar panels (PVs or photovoltaics)

- Inverter

Off-grid systems

- Charge controller
- Battery



Community Solar



Electric Vehicle Charging Station



Local Utilities

- PSE's Green Power



- PUD's Solar Express



- Seattle City Light Community Solar



Washington Incentives

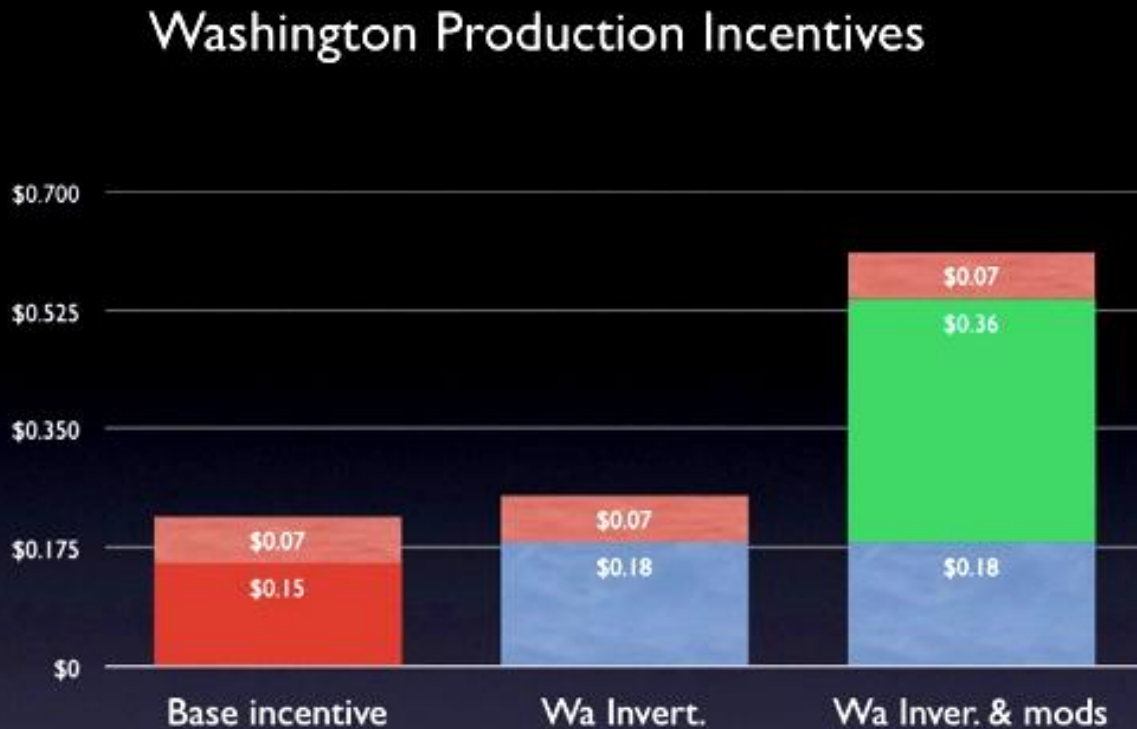


Image: Methow Net Zero

Renewable & Energy Incentives

- DSIRE Website – Washington State
<http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=WA&RE=1&EE=1>
- Federal tax credits for energy efficiency
http://www.energystar.gov/index.cfm?c=products.pr_tax_credits

Federal Incentives

Solar Electric (PV)

- 30% Fed Tax Credit
- Reduce bills 20-90%
- Run meter backwards with Net Metering

Average Sample

| | |
|------------|----------|
| List price | \$33,000 |
| Federal | -9,900 |
| Cost | \$23,100 |

Solar Water Heater

- 30% Fed Tax Credit
- Reduce bills by 80%
- Save 2 tons CO2/year

Average Sample

| | |
|------------|---------|
| List price | \$4,500 |
| Federal | -1,350 |
| Cost | \$3,150 |

Wind Power

- 30% Fed Tax Credit
- Reduce Energy Bills

Average Sample

| | |
|-----------|----------|
| Installed | \$14,000 |
| Federal | -4,200 |
| Cost | \$9,800 |

2010 Solar Tour

Saturday, October 2nd, 10am-4pm

- **FREE Self-Guided Tour of Solar Homes & Businesses**

- Kittitas, Olympia Tours 25 September
- Also visit Seattle's commercial projects

<http://www.seattle.gov/light/Green/greenPower/accomplish.asp>



Image: cc.ms.us

Online Resources



www.solaripedia.com



<http://twitter.com/solaripedia>

Rocky Top Living in Cowiche, WA

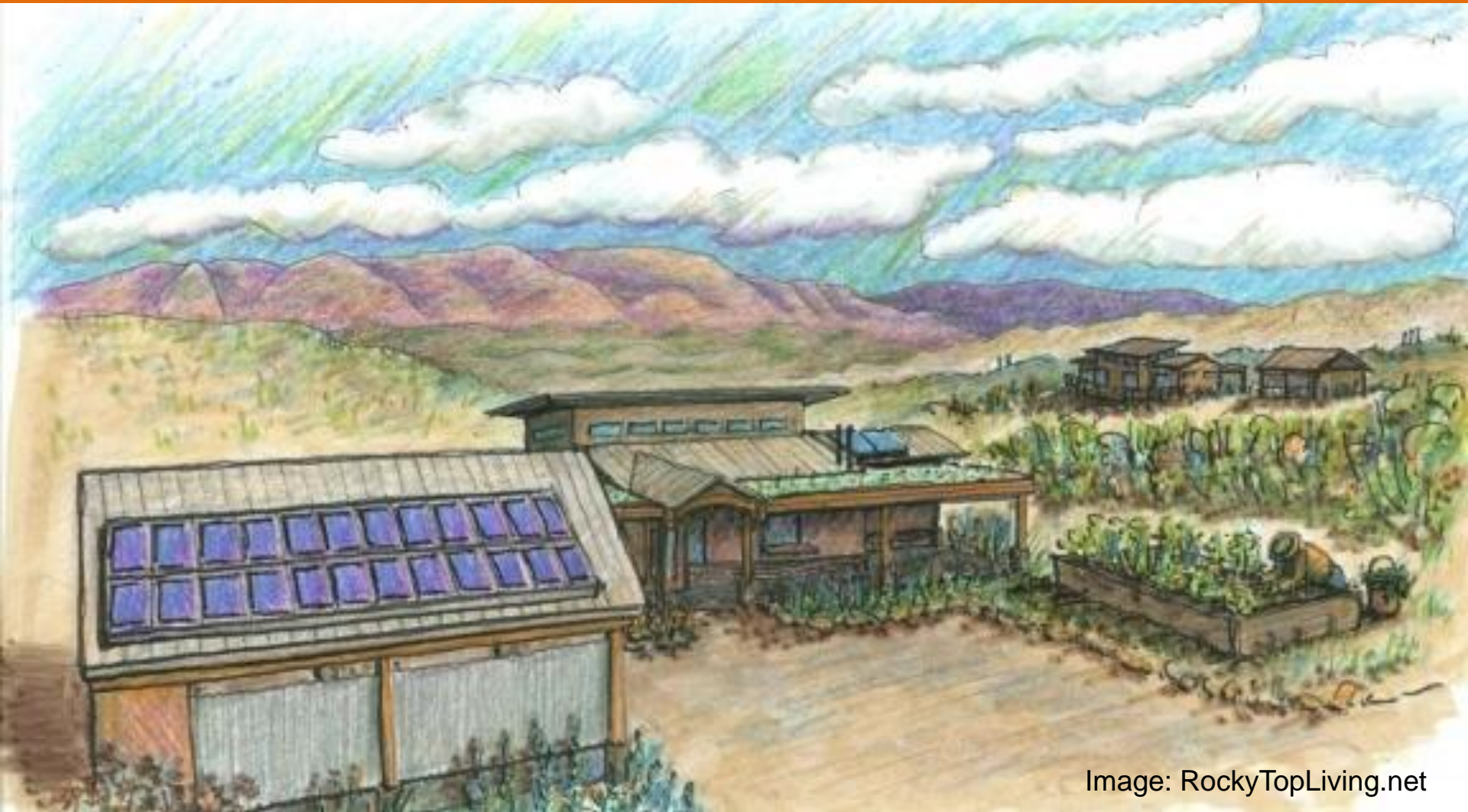


Image: RockyTopLiving.net