If you believe in climate change and don’t have solar you are a charlatan!
Simplified Schematic

- Solar Panels
- Micro Inverter
- Load Center
- Lights
- Grid System
- Batteries
OFF GRID SYSTEM

SOLAR PANEL

CONTROLLER

BATTERY

LOAD (FENCE WIRE)
How long does it take to use 1kWh?

- 60-watt incandescent bulb: 16.67 hours
- 15-watt CFL bulb: 66.67 hours
Daily Ave. Energy Usage Last 4 Years in KWh

- 2013
- 2014
- 2015
- 2016

Year:
- 2013
- 2014
- 2015
- 2016

Usage:
- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December
### Effective June 2016

<table>
<thead>
<tr>
<th>Tier</th>
<th>Charge</th>
<th>KWh</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16¢</td>
<td>Up to 304</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>23¢</td>
<td>Up to 608</td>
<td>200%</td>
</tr>
<tr>
<td>3</td>
<td>29¢</td>
<td>Over 608</td>
<td>over 200%</td>
</tr>
</tbody>
</table>

**Tier Level**
- 100%
- 200%
- over 200%

### Prior to June 2016

<table>
<thead>
<tr>
<th>Tier</th>
<th>Charge</th>
<th>KWh</th>
<th>Monthly</th>
</tr>
</thead>
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<td>1</td>
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<td>Up to 304</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>22¢</td>
<td>Up to 394</td>
<td>130%</td>
</tr>
<tr>
<td>3</td>
<td>28¢</td>
<td>Up to 608</td>
<td>200%</td>
</tr>
<tr>
<td>4</td>
<td>30¢</td>
<td>Over 608</td>
<td>over 200%</td>
</tr>
</tbody>
</table>

**Tier Level**
- 100%
- 130%
- 200%
- over 200%

---

### Region 8

<table>
<thead>
<tr>
<th>Season</th>
<th>KWh/day</th>
<th>KWh/mo</th>
<th>Temperature</th>
<th>Based</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>10.1</td>
<td>304</td>
<td>Hotter</td>
<td>Tier Level</td>
<td>Fullerton, CA</td>
</tr>
<tr>
<td>Winter</td>
<td>9.2</td>
<td>279</td>
<td>Cooler</td>
<td>Tier Level</td>
<td></td>
</tr>
</tbody>
</table>
Actions Taken to Reduce Energy Use:

- Lights - fluorescent or LED installed 2012/13
- Double Pane Windows installed 2012
- Appliances - Latest Energy Star installed 2013
- Air Conditioning - Energy Star installed 2013
- Exhaust fans in attic, garage installed 2014
- Insulation in Roof installed 2002
- Shut off lights, computer when not in use
- Artificial Grass (reduce water) installed 2014

Oops - Increased Energy Use — Grandson October, 2014
“Cool” Climate Calculator

Build your action plan

Total Reductions

0
tons CO2/year

$/yr saved: $0
Upfront cost: $0

Total Footprint

67.6
tons CO2/year

2% Better
than the average household in United States with 3 people and similar income.
Reduced Carbon Footprint With House Electricity Generated by Solar Panels
GREEN HOUSE GAS EMISSIONS WORLD WIDE
Household 20%
Auto 10.5%

Tesla Model S: The finest coal-powered car money can buy
SACRIFICES TO REDUCE CARBON FOOTPRINT

Don’t Fly—a 737 burns 1 gallon of gas per 1 ½ miles
Don’t Cruise-the Queen Mary burns 2 gallons of bunker fuel per foot traveled
Walk everywhere and save gasoline, natural gas, coal, diesel, etc.
Don’t eat meat, the flatulence will get you
Don’t use a toilet and save 1 or more gallons of water
Don’t buy on line, UPS or Fed Ex burns extra fuel to your door
Don’t...
Don’t...
WHY INSTALL SOLAR PANELS ON YOUR HOME?
1: Solar panels require more energy to manufacture than they produce in their lifetime.

2: Solar manufacturing results in more pollution.

3: Solar is too expensive for widespread usage.

4: I will store the excess energy I generate in batteries.

5: When power goes out, my home is still powered by solar.

6: My solar panels won’t work in the cold winter weather.

7: Solar panels require maintenance.

8: The payback is far too long.

9: A solar electric system will raise my property taxes.

10: Solar panels make my roof to leak, deteriorate, or collapse.
DO SOLAR PANEL INSTALLATIONS SAVE GHG?
INSTALLATION

Reasoning:
- Environment
- Return on Investment
- Rebate Ending
- Electric Car?
- Long Term
- Off Grid?
Rails Up, First Panel To Go In

Installing Brackets Under Shingles
Panels In First Two Rows Tilted for Best Sun Angle

Shows 15 degree + Angle of Panels
Looks like my house is flying away looking Northwest

Cindy’s Trees shade at 3 pm

Roof is full of pipes, skylights, etc.
Meter/Load Center
Cut off switch is to disconnect solar

Enphase Envoy
Brains of System
Solar City Installation down the street

Pipes on Side of house
NON-PIERCING ROOF BRACKET
Process: (Due Diligence a must!)

• Establish Specifications-What do you want?
  • Research What is Available
  • Everything in Writing
• Check With Roofing Company OK to Install Solar Panels
• Solicit and Evaluate Contractors
  • Competent Contractors
  • Contractor License, Insurance, BBB complaints
• Evaluate Bids,
  • Equivalent Design, Conditions, Warranties, Materials
  • Price (Turn Key include all taxes, permits, licenses, etc.
  • What sets one company apart from others?
- Contract Negotiations and Award **Everything in Writing**
- Drawings and Specifications
  - Review Drawings To Be Sure Meet Contract
- Permit (City, Fire Department, HOA)
- Application to Utility (SCE)
- Installation (3 Days)
  - Plan to **be there** to oversee materials, work being done
  - Don’t be afraid to **ask questions**
- Inspections and Approvals
  - City Inspector Your Friend-be with him during inspection
- Connect System –Permission by Edison to Connect
• Notify Insurance Company that panels are installed
• Installer Provides Warranties, Lien Releases, Manual
• Monitor System (Computer App)
  • Compare System Production vs. Design
  • Generation Daily and Monthly Basis (SCE/App)
  • Savings
• Enjoy Meter Going Backwards and $10 SCE Monthly Bill
• File for Rebate With President Obama on your Taxes
• Check For Problems-Discuss with Installer
  •Leaks in roof
  •Questions you may have
Turnkey Installation including permits and approvals

Contract: $23,000 (special roof connectors, MI, batt. con)
Rebate: $7,000 (will apply w/ 2016 taxes)
Total Capital: $16,000 Net Cost

Anticipated Savings: $1,200 first year
Monthly Electrical Bill: $9.54 for grid distribution (May go up)

25 year guarantee on panels and micro-inverters
10 year guarantee on installation
Current metal roof has 35 year guarantee remaining
Based upon $100 monthly electricity bill

**Calculator**
**Buy**

<table>
<thead>
<tr>
<th>PAY CASH</th>
<th>$0-DOWN LOAN</th>
<th>$0-DOWN LEASE/PPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own the system; maximize savings 🚀</td>
<td>Own the system; no up-front cost 🚀</td>
<td>Rent the system; no up-front cost 🚀</td>
</tr>
<tr>
<td>$20,000 20 Year Net Savings</td>
<td>$13,000 20 Year Net Savings</td>
<td>$8,200 20 Year Net Savings</td>
</tr>
<tr>
<td>$12,000 Net Cost</td>
<td>$0 Out-of-Pocket Cost</td>
<td>$0 Out-of-Pocket Cost</td>
</tr>
<tr>
<td>8.9 Years Payback</td>
<td>Immediate Payback</td>
<td>Immediate Payback</td>
</tr>
<tr>
<td>3% or more Increase in</td>
<td>3% or more Increase in</td>
<td>0% Increase in</td>
</tr>
</tbody>
</table>

**LEASE**

**CALCULATE**

Based upon $100 per month electricity bill
A comparison of how much a residential solar system could save a New Jersey homeowner, depending on whether it was bought up front, bought with a loan, or leased.
Solar City Lease Contract (free for similar sized system)

- Basic Charge about $80/month
- Tax about $7.50/month
- Surcharge $ 7.50/month
- Total about $95/month
- Annual increase 2.9%
- Very happy with negotiations, contract, installation, operation and savings
Alternatives: buy vs “free”

- Buying is preferred
  - More $ savings
  - Risks in possible maintenance costs
- “Free”-apparently problems
  - Monthly charge--some complaints little or no savings
  - When sell home may be contractual problem
  - 2.9% increase/year so $75 yr 1 goes to $128 in 20 yrs
  - Remove at end of lease, or renew lease
Problems with my roof:
- Metal shingles need special brackets to assure integrity of roof
- Must know how to walk on roof so won’t dent shingles

5 contractors (contract cost before rebate)
- Solar City—no bid due to of roof-some negatives on leasing- free!
- Freedom-$17,000 low bid, not impressed with sales person or co
- Pederson Dean-highly recommended but no bid because of roof
- Infinity solar-$20,000 mid-price, impressed, could not handle roof
- Vasco-$23,000 good company, highest price, could handle roof
Composite roof which is on most houses
  - Remove shingles then built up roof
  - 10 year warranty on built up roof but 25 warranty on panels
Rebate
  - IRS 30% changes in future years unless congress extends it
  - California rebate program discontinued - I did not get it
Net Metering program with SCE
  - I have 20 year agreement with SCE for current pricing
  - A future program may not be as lucrative
Monthly Charge $9.54

Calculation of Usage

April 2016 kWh

- Enphase Generation 646
- Transmitted to SCE 481
- Used during day 165
- Used at night 276
- Total used 441
- Excess “sold” to SCE 205
ENPHASE
ENLIGHTEN

Components’ proportions not to scale
**Multiplication effect = Increase selling power**

In the case that the power of the solar panel is big enough, household electricity can be supplied from solar energy only.

- **Electricity consumption for household use**
- **Electricity generated from solar panel**

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**Power Storage**
- The electricity price is cheap in the night

**Buy Power**
- State Grid

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**Power storage battery**
- Invert output from power storage battery, reduce the using of grid electricity when the electricity price is high.

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**Electricity that sold to State Grid. (extra electricity)**
**Net Surplus Compensation Rate and Renewable Energy Credits Compensation Selection Form**

<table>
<thead>
<tr>
<th>Customer Information (as it appears on your monthly SCE statement):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer or Business Name</td>
</tr>
<tr>
<td>Street Address</td>
</tr>
<tr>
<td>City, State, Zip</td>
</tr>
<tr>
<td>Phone</td>
</tr>
<tr>
<td>Service Account #</td>
</tr>
</tbody>
</table>

**Net Surplus Compensation (NSC):**

- [ ] I am interested in receiving compensation for the Net Surplus Energy I generate during my 12-month relevant period. The NSC will be posted on a monthly basis at: [http://www.sce.com/sps/portal/home/regulatory/tariff-books/rates-pricing-choices/net-surplus-compensation](http://www.sce.com/sps/portal/home/regulatory/tariff-books/rates-pricing-choices/net-surplus-compensation); or,

- [ ] I am not interested in participating in the program and elect not to receive compensation.

- [ ] In order to receive Net Surplus Compensation (NSC), I certify under penalty of perjury that my generating facility is a Qualifying Facility pursuant to the Public Utility Regulatory Policies Act of 1978 that is exempt from certification filing at the Federal Energy Regulatory Commission (FERC); or,

- [ ] In order to receive NSC, I certify under penalty of perjury that my generating facility is a Qualifying Facility pursuant to the Public Utility Regulatory Policies Act of 1978 and that I have self-certified as a Qualifying Facility with the FERC by properly completing and filing FERC Form No. 556, Certification of Qualifying Facility (QF) Status for a Small Power Production or Cogeneration Facility. A copy of my completed FERC Form No. 556 is attached here. **NOTE:** this option is applicable only to the California Department of Corrections and Rehabilitation when installing a Renewable Electrical Generating Facility sized greater than one megawatt (1 MW) pursuant to Public Utilities Code Section 2827 and Schedule NEM.

**Net Surplus Compensation and Renewable Energy Credits (REC) Compensation:** (please check one box below):

- [ ] I elect to receive a check for my NSC and REC at the end of my relevant period. SCE will perform a normal reconciliation and will zero out my account.

- [ ] I elect to roll over any credit for my NSC and REC to my next relevant period. SCE will perform a normal reconciliation and will zero out my account. Any NSC credit and REC credit will be carried over into the next relevant period and will be applied to my future electricity bills.

**NOTE:** To receive compensation for RECs associated with your Net Surplus Energy, Form 14-935 must additionally be completed and submitted to SCE.

By completing and returning this form to SCE, I confirm the above NSC and REC payment selections. I understand that the terms of my selections are subject to any future changes directed by legislature, the California Public Utilities Commission, or applicable law. I understand that I can change my compensation selection once every 12 months.

Form 14-906

09/2014
1. **Do it now!** Costs for panels low, competition reduces costs
2. Go for the lowest per KWh cost (from reputable company)
3. Contractor should be member of NABCEP
4. Federal Credits: 30% thru 2019, 26% thru 2020, 22% thru 2021
5. Lease not as lucrative as buying
6. Warranty based upon output reduction about 0.5% per year
7. Energy generators trying to reduce incentive of Net Metering
8. Be sure roof in good condition
   1. Don’t allow roof penetrating brackets
   2. Replace roof first if in poor condition
What To Know About Rotating Outages

This year, the SoCal Gas Aliso Canyon facility (a major storage facility of natural gas) has restricted operations and is unable to provide natural gas to power plants as in prior years. While SCE is doing everything it can to minimize this impact to our customers, the California Independent System Operator (CAISO) may call for rotating outages.

A rotating outage is a temporary and controlled electric outage that lasts approximately one hour, depending on circumstances. A utility manages and rotates the outages to protect the integrity of the overall electric system. Controlled, rotating outages can become necessary when the CAISO declares a Stage 3 Emergency. Under these circumstances, without controlled, rotating power outages on a relatively small scale, a widespread disturbance to the electric grid could occur, which would lead to uncontrolled, large-scale outages. Find out more about at the CAISO Flex Alerts and Stage 3 emergencies at flexalert.org.

Prepare Before a Rotating Outage

- Go to www.sce.com/outage to see which Rotating Outage Groups are likely to be affected if needed.
- Be ready in case of power outage - Have emergency supplies in a place you can easily find them – on.sce.com/outagetips

During a Rotating Outage

- Be aware of your surroundings and be safe.
- Turn off all appliances, machinery and equipment that were in use when the power went out.
- Switch off light switches (except one). Leaving a light on will let you know when electricity has been restored.
- Minimize driving in an outage area. If traffic lights are not functioning, treat as four-way stops.

After a Rotating Outage

- Continue to conserve energy. Energy conservation, both electricity and natural gas, is critical to help maintain grid reliability and service.
- To learn more about energy conservation, visit SCE’s website: on.sce.com/tips, or follow us on Twitter: twitter.com/SCE and on Facebook at: facebook.com/SCE.
WHEN DOES AGE ENTER INTO YOUR DECISION?
Making electricity with solar panels, entails 91% less CO2 pollution than using natural gas, and 96% less CO2 than coal. Not to mention the sun won’t run out of fuel for another 5 to 7 billion years.

Going solar is the simplest and biggest action a home or organization can take to reduce its carbon footprint.
If you believe in global warming/climate change and don’t have solar panels generating electricity for your house and car you are a charlatan!

“Keep it in the Ground” Government policies will increase KWh costs.

If you can’t afford solar panels—let someone else do it and at least know you have reduced your carbon footprint by 20%.

Do it Now!
1: Solar panels require more energy to manufacture than they produce in their lifetime.
2: Solar manufacturing results in more pollution than is saved.
3: Solar is too expensive for widespread usage.
4: I will store the excess energy I generate in batteries.
5: When the power goes out, my home is still powered by solar.
6: My solar panels won’t work in the cold winter weather.
7: Solar panels require maintenance.
8: The payback is far too long.
9: A solar electric system will raise my property taxes.
10: Solar panels cause my roof to leak, deteriorate, or collapse.
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