The presentations will begin at 7:00 pm. Please mute your microphone. Use the chat box to post questions "to everyone" throughout the presentation. There will be Q&A after presentations.

Unitarian Universalist
Fellowship of Sunnyvale

UUFS.org/cat
email: climate@uufs.org

SunWork: https://sunwork.org/
email: info@sunwork.org

ABOUT US

The UUFS Climate Action Team was formed in response to the concerns many of us have as to how we can take action tn address the climate crisis and help build a more sustainable future.

SunWork is a 501(c)(3) nonprofit working with homeowners with low monthly electricity bills, volunteers, and nonprofits to make solar more affordable and widespread.

MORE INFORMATION:

Chat Intros

1. Your name
2. City you live in
3. Anything in particular you're hoping to learn today

SunWork
Renewable Energy Projects

Small Solar Made Affordable

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Agenda

Going Solar

- Why Go Solar
- How Solar Works
- Technology Options
- PG&E and Net Metering
- Solar Economics
- SunWork Qualifications
- Q & A

Electrification

- Why Electrification
- Heat Pump Water Heater
- Air Source Heat Pump
- Induction Cooking
- Electric Clothes Drying
- EV Chargers
- Batteries and Backup
- Q & A

SunWork Overview

Mission: Help make solar more affordable and widespread with the help of trained volunteers.

SunWork is a 501(c)(3) nonprofit in the Bay Area & Central Coast
Audiences served:

- **Homeowners** with low monthly electricity bills of <$100/month (not including EV charging); <$140 for all electric homes
- **Volunteers** who want to learn about solar, green careers, and help the environment
- **Nonprofits** such as churches, preschools, homeless shelters

Cost savings up to 1/3 less

Why Go Solar?

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Save on utility bills right away

Avoid future utility price increases

Reduce greenhouse gases

Increase property value

Technology Interest

How Solar Works

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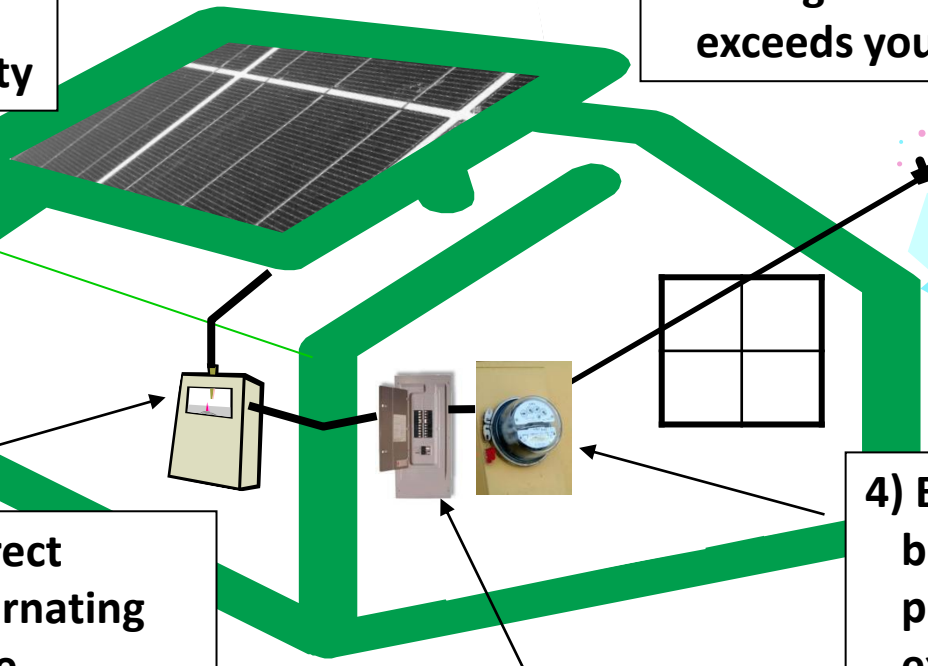

1) Solar panels convert sunlight into direct current (DC) electricity

2) Inverter converts direct current (DC) into alternating current (AC) for home electricity use & keeps track of solar output

3) Existing electrical panel distributes solar electricity to the house

4) Electrical meter "spins backward" when solar power production exceeds the house demand & power is sold back to utility

5) Power from utility is automatically provided at night & during the day when your demand exceeds your solar production

Roof Considerations

Roof should be in good condition:

- **15 – 20 year life remaining is best**
- **Ideal to install solar on new roof**
- **Removal and replacement of panels for a reroof is ~$600/kW**

More Expensive to Install Solar

- Composition shingle
- Standing seam metal roof
- Modified bitumen flat
- Concrete tile
- Shake if new and not brittle
- Tar and gravel flat
- Spanish/clay tile
- Shake if old and brittle

<u>Many contractors will not install on:</u>

- Slate
- Hardie shake

Selecting Solar Panels

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Consider aesthetics, efficiency/space, track record

Polycrystalline (multi)

Semi-uniform blue color

Monocrystalline (single)

Black color

12-21% efficient
25-year power warranty

SunWork Sample Panel
QCELLS Q.PEAK DUO-G7

- 325 Watt
- Monocrystalline
- 5.5 feet by 3.3 (120 cells)
- Up to 19.9% efficiency
- 25-year 85% Power Production Warranty

Inverter Options

	Install Use Case	Shade	Inverter Warranty	Monitoring	Panel Directions
 **Central Inverter (SMA)**	Medium & Large (>1.5 kW) no shade (Min. 5 panels)	Poor	10 yrs	Only Whole System	Up to 2 directions
 **Microinverters (Enphase)**	Small systems, or Medium systems with shade*	Good	25 yrs	Panel Level (Envoy)	Any
 **DC Optimizer (SolarEdge)**	Larger systems with shade (min. 8 panels)	Good	12 yrs	Panel Level	Any

*Enphase is only option for systems with 4 or fewer panels

Solar Customer Utility Billing

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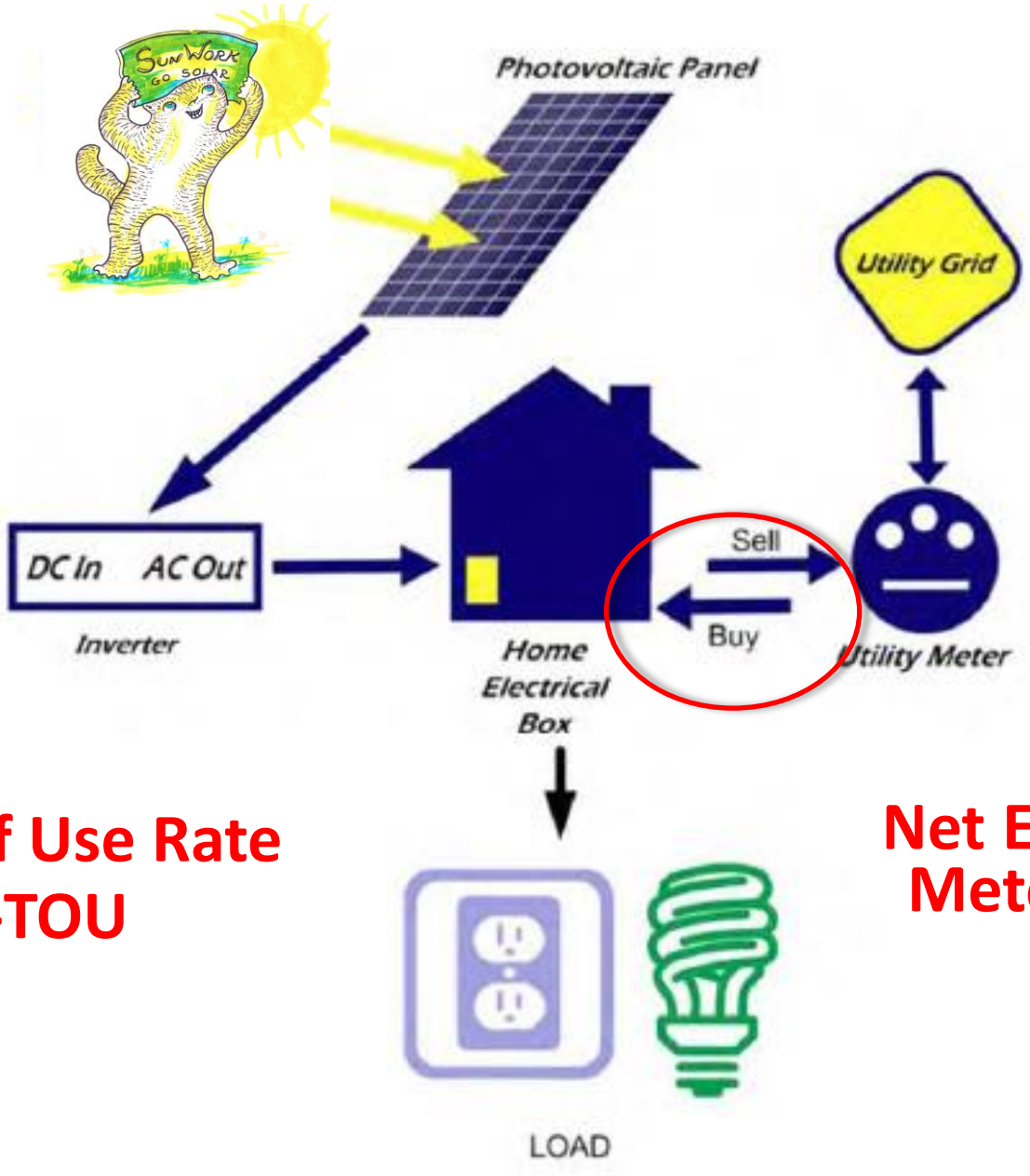

Time of Use Rate
E-TOU

Net Energy Metering = "NEM"

[Current PG&E Residential Rate Plans]

PG&E's Net Energy Metering
NEM 2.0 Program

PG&E is your "battery":

- You sell excess power you generate and you buy power back when it's needed

Billing:

- Minimum delivery charge of ~$10/month
- Annual "True-Up" bill:
  - PG&E tracks the power you sell/buy each month
  - Each year you pay PG&E for the net (purchases minus sales)
  - If generation > consumption for the year, you get paid ~$.03/kWh

NEM 2.0 is a very good deal, but a less-desirable NEM 3.0 may happen in next year or two
NEM 2.0 is grandfathered for 20 years

System Sizing and Design Depends on a Variety of Factors

- Anticipated annual electricity usage (kWh/yr.)
  - Historical
  - Expected future loads (new electric vehicle, heat pump, etc.)
- Roof space available
- Roof orientation (direction panels face)
- Shading
- Based on these factors determine:
  - Panels: quantity, type, efficiency
  - Inverter type

Roof Direction Impact on Design & Sizing

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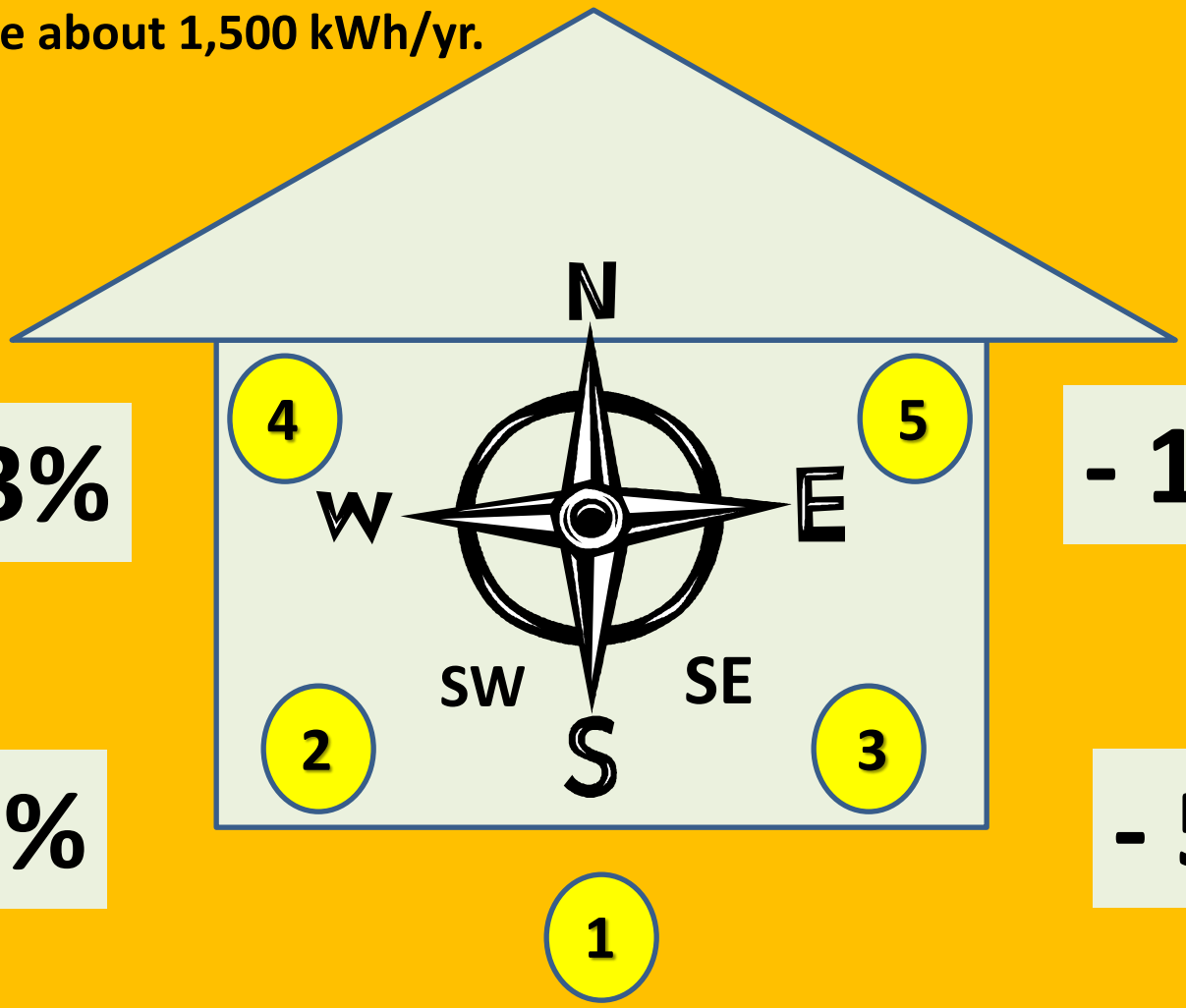
Under "perfect conditions" 1 kW will produce about 1,500 kWh/yr.



- 13%

- 15%

- 3%

- 5%

Electric Vehicle (EV)
Electricity Usage and Solar - Rough Guideline

How many EV miles driven in a year?

10,000 miles

How much charging is done at home?

50% or 5,000 miles

5,000 miles = 1,500 kWh = 1 kW of Solar = ~3 panels

Assumes Nissan Leaf (.30 kWh/mile), south facing, no shade, 320-watt panels

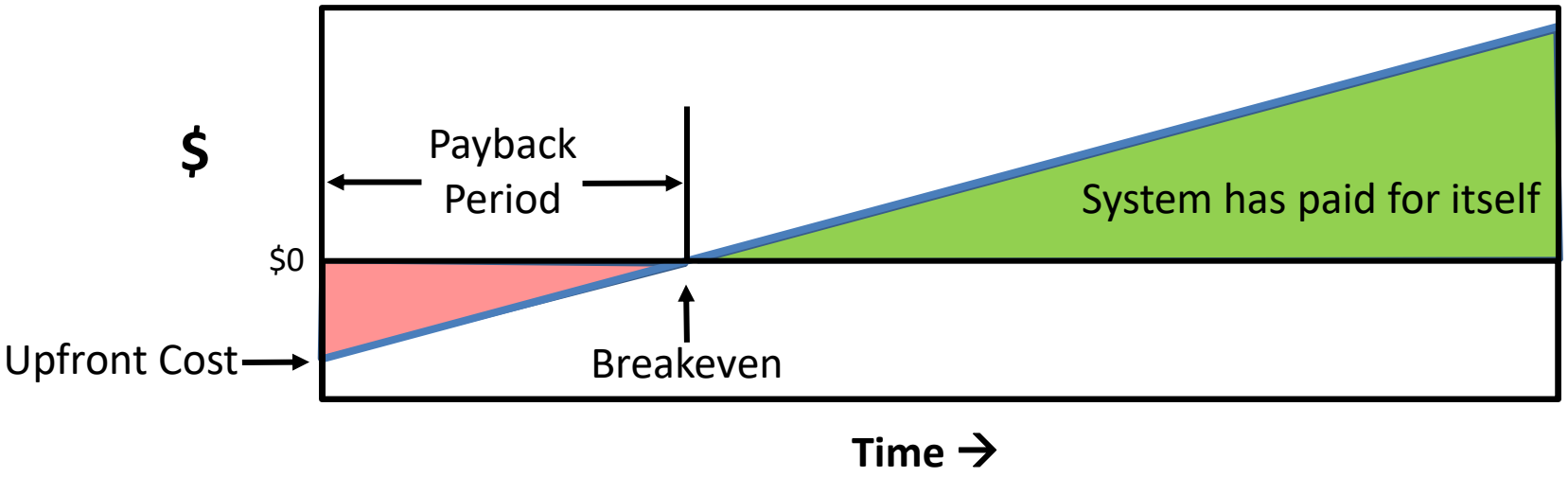
Research EV efficiency ratings at fueleconomy.gov

Payment/Financing Options

- Cash Purchase
  - Generally the best approach
- Loans
  - Good alternative to cash
- Leasing/Power Purchase Agreements
  - Better with large systems

Cash Purchase

- You pay for system upfront and own the system
- You get federal tax credit (26% in 2020; 22% in 2021)
- You maintain the system and are responsible for any repairs beyond the equipment and installation warranty periods
- No financing costs, so best option if you have the cash



Loans

- Similar to a purchase:
  - Financed through a loan but you still own the system
  - You still get the federal investment tax credit
  - You still are responsible for maintenance and for repairs beyond warranties
- Loan options:
  - From installer
  - Home Equity Line of Credit
  - Credit Unions
  - Property-Assessed Clean Energy (PACE)

Solar Lease or Power Purchase Agreement (PPA)

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- Finance company owns the system
  - Typically, homeowner pays a monthly fee to lease the equipment
- Considerations
  - Low up-front cost (varies from $0 to $1,000)
  - You save just 10% to 50% on your electricity bills for the agreement lifetime
  - Finance company takes the investment tax credit
  - Company is responsible for repairs if components fail
  - Annual cleaning may be included
- Potential Issues
  - Make sure agreement can be transferred to new homeowner
  - PPAs often include an escalator clause to increase over time
  - Consider who pays for costs of removal and replacement if reroof needed

SunWork Solar Installation
Example: $90/month electric bill

Solar System:

- 2.88 kW (DC) system (9 Solar Panels 320W)
- SMA Central Inverter
- Installed Cost:
  - $7,850 before tax credit ($2.73/W)
  - $5,810 after 26% 2020 tax credit ($2.02/W)

Economics:

- $960 annual savings
- 6-year simple payback (after tax credit)
- 18% IRR over 25 years*

Assumptions:

- South-facing roof (composition shingles**)
- 5% shading
- PG&E ETOU-A rate, T Baseline, $300 permit

For more information, visit SunWork.org

or call 805-229-1250 or 650-520-9918

* IRR does not include expected incremental savings anticipated by avoiding PG&E rate increases.

**SunWork works with the following types of roofing materials: composition shingle, cement tile, modified bitumen and select metal seam roofs.

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SunWork Solar Installation
Example: $50/month electric bill

Solar System:

- 1.60 kW (DC) System (5 Solar Panels 320W)
- Microinverters for individual panel optimization
- Installed Cost:
  - $5,450 before tax credit ($3.41/W)
  - $4,030 after 26% 2020 tax credit ($2.52/W)

Economics:

- $480 annual savings
- 8-year simple payback (after tax credit)
- 11% IRR over 25 years*

Assumptions:

- South-facing roof (composition shingles**)
- 5% shading
- PG&E ETOU-A rate, T Baseline, $300 permit

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Who Qualifies for SunWork?

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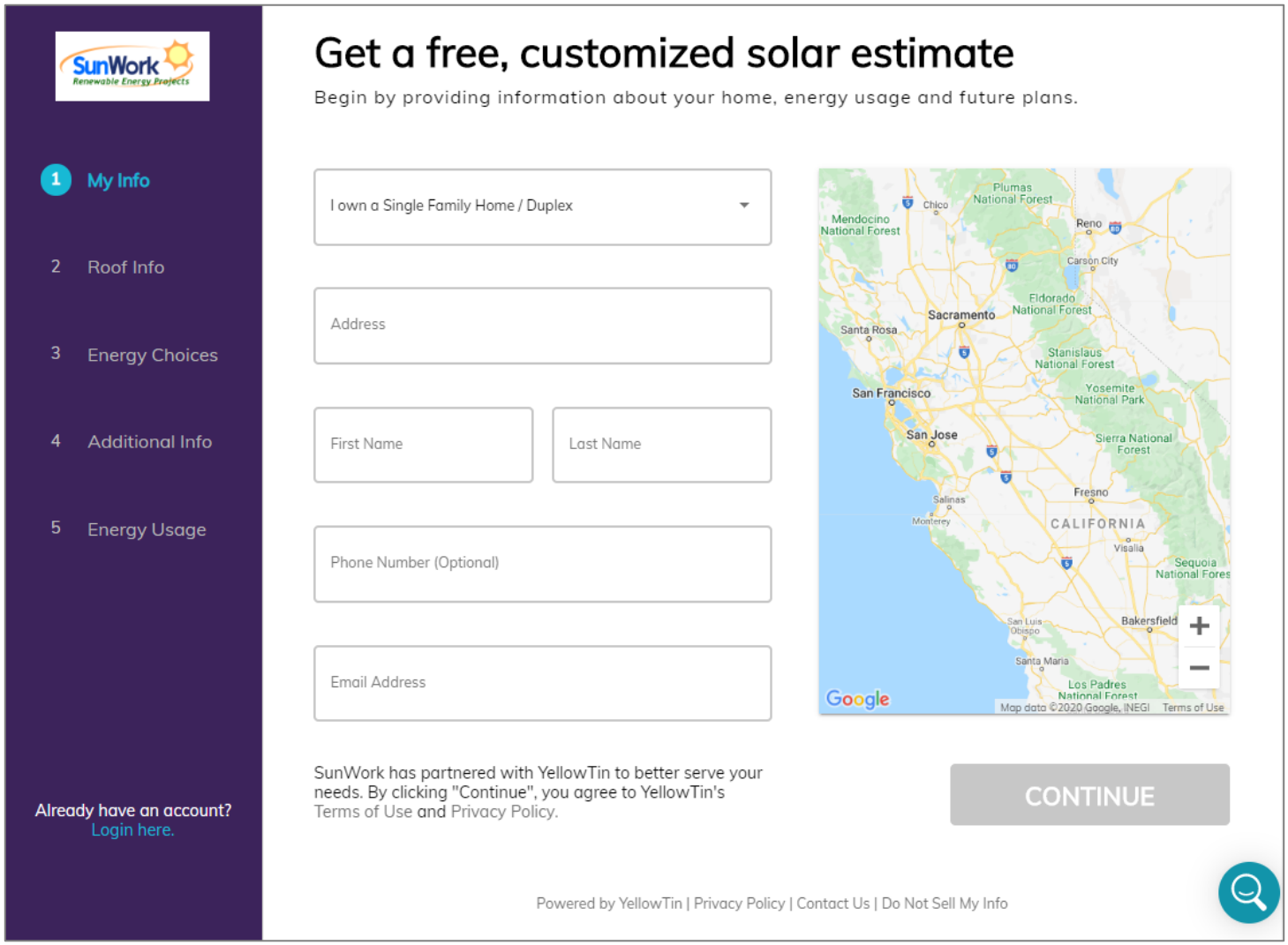
- Overall criteria: Homeowners with electricity bills averaging **$100** or lower for the last 12 months
- Average monthly bill of **$140** or lower for 12 months for the following situations:
  - Heat pump water heater or air source heat pump installed (or planned)
  - All-electric space heating
  - Those on medical baseline
- No monthly maximum for those on PG&E CARE or FERA rates
- Costs for charging an existing Electric Vehicle are subtracted from the total electricity bill
- Meets roof type and roof access criteria (e.g. Composition shingle, less then 26.6 degree pitch, etc.)

See https://sunwork.org/solar-for-your-home/#qualification

Free Customized Solar Estimate

SunWork.org/getsolar



Key Steps to Going Solar

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- Free solar **consultation** and rough estimate via email
- Free **site survey** at your home
- Receive/review **proposal**
- Sign **contract** for solar installation
- **Installation** of solar system typically 1 or 2-day installation (on weekends with SunWork)

Please note that we are working hard to keep safe during COVID-19:
https://sunwork.org/covid19-response/

Our Volunteers

Volunteers taking action to help with the environment and climate change

- Students studying conservation, construction, green building
- People wanting to help with own or friend's solar install
- Community members who want help with environment
- Nonprofit members

We conduct volunteer webinars – See our upcoming schedule:
https://sunwork.org/volunteer/#training

Q&A

- Any additional questions about going solar?

Agenda

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Electrification – When You Go Solar It Makes Sense to "Electrify"

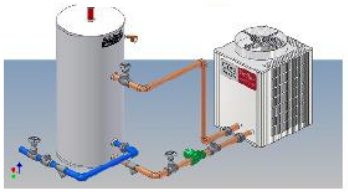
Green Building Codes

Buildings

Heat Pump Hot Water
Air Source Heat Pump
Induction Cooking
Electric Clothes Drying

Transportation

Electric Vehicles
E-bikes
EV Chargers



SILICON VALLEY CLEAN ENERGY

PENINSULA CLEAN ENERGY

Monterey Bay Community Power

Carbon-Free Electric Grid

What's the Best Choice for Electric Water Heaters

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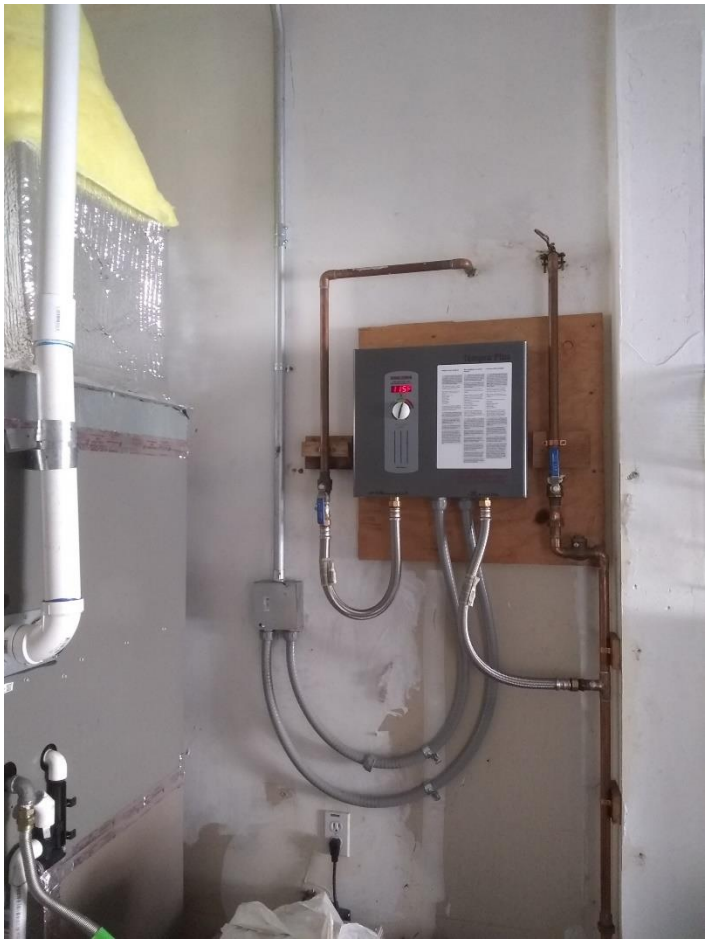

Tankless Whole House Water Heater

Heat Pump Water Heater

Heat Pump Water Heaters - Benefits

- Cleaner and Efficient - Burn less fossil fuel
- Saves You Energy and Money
- Less Air Pollution
- Cools the Air around the Water Heater
- Cost:
  - Equipment cost = $1,200 - $2,000
  - Installation cost = $3,000 - $4,000
  - Rebates often available from utility or local CCE

Air Source Heat Pumps - 2 Types

Central Air Source Heat Pump
(uses air ducts)

Air Source Heat Pump Mini Split
(ductless)

Air Source Heat Pumps

- Replace your gas furnace, burn less fossil fuel
- No exhaust, no carbon monoxide (CO) pollution
- Use it for Heating AND Cooling
- Central ducted system, or multi-zone ductless mini-split system
- Independent zones
- Cost:
  - Minisplit cost plus installation = $2,500 - $6,000 (1 to 4 zones)
  - Central ducted heat pump = $8,000 - $10,000

Induction Cooking

- Heats the pan & food inside, not the space around it
- Provides better heat control than conventional electric
- Uses 25% less energy than conventional electric heating elements
- Built-in induction cooktop stoves or portable models are available
- Costs:
  - Single/dual portable models: $50 - $100
  - Built-in model: $1,200 - $3,000
  - Rebates: check with your CCE and BayREN

Electric Clothes Drying

- This a pricey solution in search of a problem
- Save your money, buy a standard electric dryer and only use it when "Solar Drying" (a clothesline) just isn't an option
- Clotheslines have fewer parts and are more reliable
- Costs:
  - $1,500 and up
  - Rebates: check with your CCE and BayREN (currently $300 rebate)

Electric Vehicle Chargers

- Charge your electric vehicle at home
- Charge when rates are lower and save by using a timer
- A 240v (Level 2) charging stations use less energy than charging with 120v (Level 1)
- Portability: Plug-in vs Hardwired
- "Solar Boost" charging with solar installed (SolarEdge)
- Cost:
  - Equipment cost = $500 - $1,200
  - Installation cost = $300 - $1,000
  - Rebates: Check with utility and local CCE for rebates

Batteries & Backup

- Solar system does not provide power when grid is down (required to disconnect from the grid during an outage)
- Batteries needed for solar to support emergency backup
- Cost to add batteries to a home's electrical system ranges in cost from $18,000 - $30,000 (+ solar system cost)
  - Self-Generation Incentive Program (SGIP) provides storage rebate
- Start by calculating emergency loads and how long backup energy required (hours, days or weeks)
- Consider portable options for emergency purposes

Backup Options

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Type	Use Case	Cost
Gas generator	**Emergency power – short term** - Up to 5000 Watts, 120 and 240 V - Multiple outlets with extension cord - Must operate continuously, refueled every 8-24 hrs.	$500 to $3000 plus fuel
Portable battery "solar generator"	**Emergency power and camping – short term** - Up to 3000 Watts, 3000 Watt-hours per unit - Portable, multiple outlets including USB per unit - Can be used indoors near end use	$1,000 to $3,000 (Plus portable solar panels to charge)
Generator + manual transfer switch or critical load subpanel	**Emergency power – short term** Integrated system with limited critical home circuits accessible via manual switch	$500 to $2,000 for electrician (Plus cost of generator options above)
Solar + batteries AC-coupled	**Emergency power plus load shifting – long term** - Up to 7000 Watts, 14,000 Watt-hours per unit (Tesla Powerwall) - Seamless backup to critical circuits - Already having solar and adding batteries - Planning to add batteries later	$18,000 - $30,000 + solar system cost; Eligible for fed tax credit CA SGIP rebate if cycled
Solar + batteries DC-coupled	**Emergency power plus load shifting – long term** - Up to 7000 Watts, 14,000 Watt-hours per unit - Seamless backup to critical circuits - Installing new solar + battery system at same time	$18,000 - $30,000 + solar system cost Eligible for fed tax credit CA SGIP rebate if cycled

DIY Portable Solar Generator

SunWork
Renewable Energy Projects

Portable Battery Storage Unit

Movable Solar PV Array

Q&A

- Any additional questions about electrification?

Thank You!

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