



## ARCHITECT, BUILDER & DESIGNER: SOLAR TIP SHEET

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### Does Solar Work In Seattle?

Yes! Our region's long summer days and temperate climate are ideal for solar photovoltaics (PV). Net Metering is the agreement with the Utility in which kilowatt hours (kWhs) are exchanged on a 1:1 basis. This allows solar owners to "bank" kWhs as "credits" in the grid when their solar is producing more electricity than they are using, which happens mainly early spring through the fall. In Seattle, solar produces roughly 80% of its output in just six months, between April to September. The banked credits are then used to cover electrical usage at night, and in the dark and rainy months of winter when the solar doesn't produce as much. In this way, the grid acts as unlimited, free storage. Learn more at [www.pugetsoundsolar.com/FAQ - What is Net Metering?](http://www.pugetsoundsolar.com/FAQ-What-is-Net-Metering?)

### How Much Solar Does An Average Home Need?

An average house in Seattle consumes about 12,000 kWhs per year, which is around 32 kWhs per day. It takes 30 to 40 solar panels (sometimes more) to offset 100% of that average usage, depending upon 1. What direction(s) the roof faces. 2. The degree of shading on the roof. 3. Which equipment is selected.

We see electrical use ranging from a low 5 kWh/day to over 200 kWh per day – a huge variation! Many of the larger, all-electric homes use 70+ kWh/day.

### System Sizing

It's important to understand the Net Metering fiscal year restarts every April 1st. All kWhs still "in the bank" on March 31st are forfeited to the Utility without compensation. For this reason, we design systems to offset 100% of the consumer's average annual electric usage – and no more. The primary way to properly size a solar PV system is by looking at the home's historical electrical usage. We can't accurately estimate how much power a building will use based on square footage or how many people live there. The main factors are the draw of each electrical appliance installed and how much each appliance is used by the homeowner. Currently, we are not quoting for solar until the homeowner has received *at least one* bill from their electric utility.

### Which Kind Of Roofs Are Best For Solar?

Composition shingle, standing seam metal, membrane/PVC, and torch-down are the best surfaces for solar PV. Standing seam roofs are ideal for solar, as the mounting system clamps to the standing seams with minimal roof penetrations. Membrane and torch-down roofs require professional roofer assistance to waterproof the penetrations, which adds to the costs.

Flat cement tile, corrugated metal and Interlock metal all can work but are more expensive due to increased labor costs. We look at these roof types on a case by case basis. We do not install on most ceramic tile or shake roofs.

The panels, inverters, and workmanship are warranted for 25-years - so it's best to have 10+ years of life left in the roof prior to installing solar. Costs to remove & replace a system for a re-roofing project typically run \$200 to \$300 per panel.

**Electrical System:** Most solar connects via a 2-pole breaker opposite the feeders. A 225A (amp) rated bus with a 200A service will cover systems up to around 13kW. For larger systems, we use a supply-side tap.

**Electrical Rough-In For New Builds:** A “rough-in” can be done by Puget Sound Solar or your own electricians. A rough-in usually includes installing some basic system components and the electrical conduit in the wall from the roof to the electrical panel. Without a rough-in, the conduit is strapped to the exterior of the building. The best time for a rough-in is after the roof and electrical panel are installed and before the walls are closed. Please refer to our rough-in tip sheet for more information. A rough-in is an extra job & service and a separate contract from the solar. We do discount the later solar installation if a rough-in has been completed.

## Design Considerations

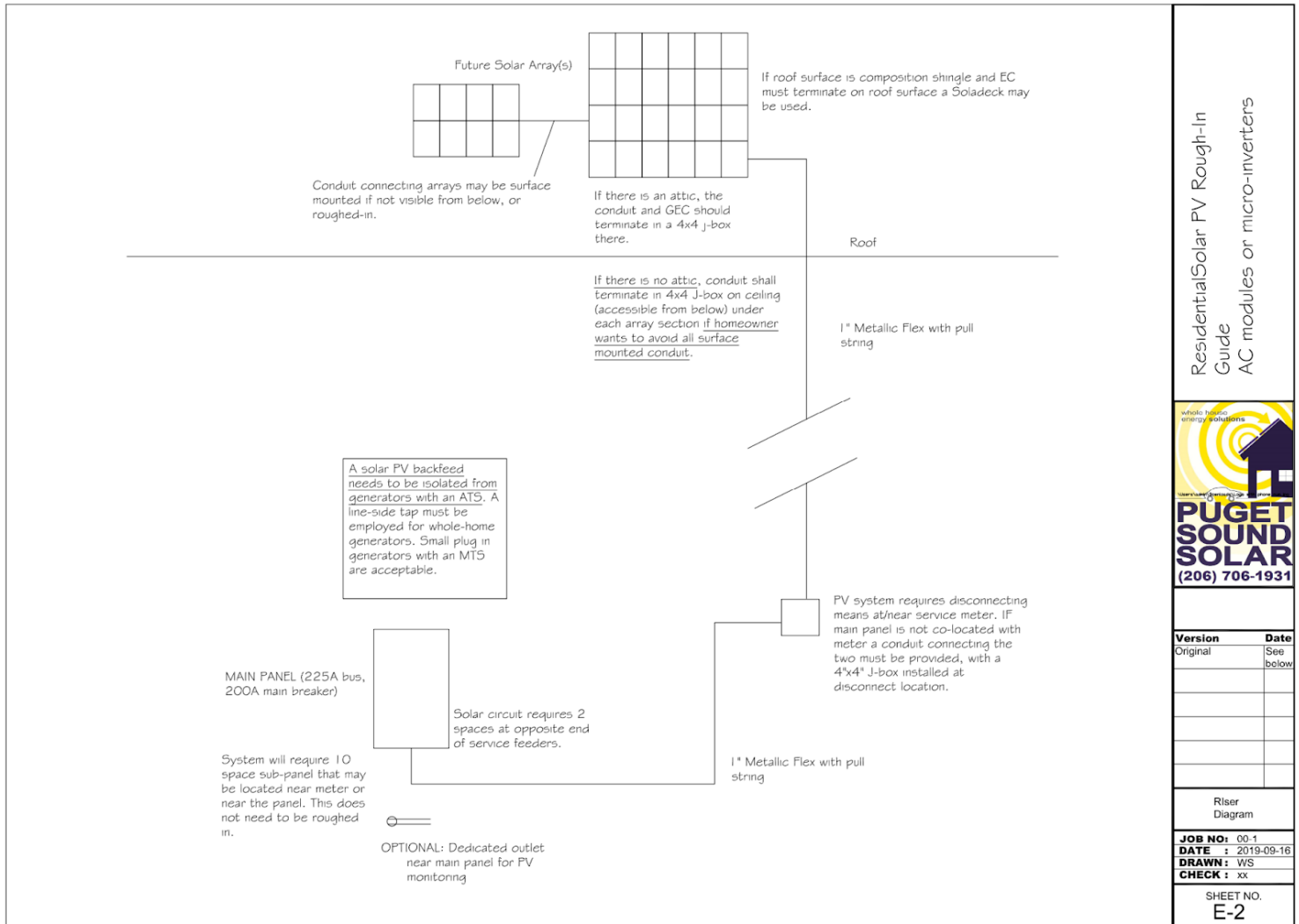
- Solar panels work best on South, West, and East facing roofs - in that order. North-facing roofs are generally not appropriate for solar, but can work on lower slopes.
- Shade on the roof from trees, chimneys, stacks, adjacent buildings and even overhead wires can have large impacts on solar, especially if the obstructions are south of the target area. Keep obstructions and vents north of areas targeted for solar to avoid shading.
- Any trees or plantings south of the building should be chosen to grow no higher than the gutter when fully mature.
- The ideal roof slope is from 4:12 – 8:12. East and west facing roofs will produce better at lower slopes.
- On roofs less than 1:12 slope, we recommend using tilt-up racks. These rows need to be spaced apart to avoid inter-row shading. The standard is a 10° tilt with rows spaced at least 20” apart.
- Use the [PVWatts Calculator](#) to find the optimal tilt and panel azimuth (direction) for your project.
- Standard solar panels are typically about 76” x 40”.
- The panels we are selling today produce from 380W (watts) to 405W each, depending on the manufacturer and cell efficiency.
- Solar generally adds about 3 to 5psf (pounds per square foot) to the dead load of the roof. Ballasted solar systems (weighted rather than mechanically fastened) can add up to 7psf.
- Setbacks (open space) are required by fire code. A general rule of thumb is to leave a clear 18” perimeter on each roof face except to the gutter.
- Standing seam metal and composition shingle are preferred roof types. For standing seam metal, please call out a solar-friendly seam profile compatible with [S-5](#) clamps.
- In most cases, the panels sit around 6” higher than the roof, parallel with the roof slope.

## Costs

- The cost to install a system is typically about \$2.50 to \$4.00 per watt - including materials, labor and permitting. Therefore, a 2.4kW system would range from \$6000-\$9600 before the tax credit, and a 12kW system (most typical) ranges from \$30,000 - \$48,000 before the tax credit.
- Cost adder examples include roof type, roof steepness, roof height ex. over 2 stories, # of separate arrays on the roof (one big rectangle, or panels scattered around the roof), extra electrical work, distance from our shop.
- Batteries typically cost about \$20,000 for a single 10kW unit installed and additional units are \$8000 each before the tax credit. Batteries draw power in standby mode just to keep themselves running, and will reduce your available solar credits even if the batteries are not actively used.
- Maintenance costs include periodically cleaning the panels. Cleaning will need to be done more often if the panels are low-sloped.
- The entity paying for the system, usually the homeowner, is eligible for the Federal Tax Credit, which is 30% until 2033.
- Builders and developers must own the home for five-years to be tax credit eligible.
- There is a Washington State sales tax exemption on solar and battery installations. This includes labor, permit fees and any necessary electrical work to get the system operational.
- Systems are designed & warranted to last 25-years.



# Rough in tip sheet



Residential Solar PV Rough-In Guide  
AC modules or micro-inverters



Version	Date
Original	See below

Riser Diagram

JOB NO: 00-1  
DATE : 2019-09-16  
DRAWN: WS  
CHECK: xx

SHEET NO.  
E-2

- More Resources:**
- [Puget Sound Solar - Seattle, Washington](#)
  - [Project Sunroof - Google.com](#)
  - [How Solar Works - Solar Washington](#)
  - [PSE - Energy Cost Guide](#)

