

Solar Electricity for Jefferson County

What would it take to run Jefferson County PUD on Solar Energy?

How many panels?

How many batteries?





Jefferson County Public Utility District

In April of 2013 the PUD took over operation of the grid, becoming the first public agency to take over a private system in WA in more than 65 years.

Over the last 6 years the PUD has grown from 8 to 50 employees, and serves over 19,700 electric customers and 5,000 water and septic customers on operating budget of approximately \$39 million per year.

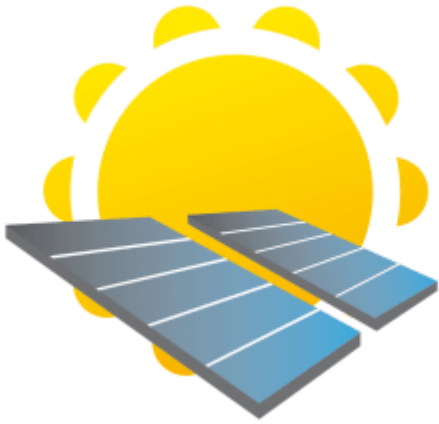
What would it take to generate our own electricity here in Jefferson County, instead of buying it from Bonneville Power?

Let's do the arithmetic!



JEFFERSON PUD SERVICE AREA MAP





Proposed solar project – from Jefferson Co. PUD web site.

½ acre next to the substation at Kearny and Clay

326 panels, 320 watts each

104 KW, \$400,000.

Compare to Jefferson Co. PUD total electric load – how many panels would we need to generate 24 hours worth of electricity during the time the sun is shining? -- Assuming there are batteries to store the power overnight.

Yearly Average usage of 45 MW

940,000 solar panels

31 panels per person

Maximum Electric Load in 2019, 104 MW

5,500,000 solar panels

183 panels per person



Why does it take so many panels?

In the summer, when power demand is the least, a solar panel will produce 4.8 hours of full power equivalent. (Over the year, the average for our area is 3.6 hours.)

In the winter, when demand is the most, the value drops to 1.4 hours

So why not store up energy in the summer and use it in the winter?

--Current battery technology loses charge rapidly (like your cell phone).

--Fine for overnight, but doesn't work for summer to winter

With long term electric energy storage, solar panels would work a lot better!



What kind of batteries are available?
Li ion, like your cell phone or electric car

How many batteries would it take, if you want electric power on all the time?
Look at the highest demand load.

From PUD data, 2019, February 7, total power usage for that (24 hr) day was 3,756 MWH

Batteries – 232 KWH per power pack. Need 16,000 power packs.





Powerpack Size

- **Powerpack Unit**

- Length: 1,317 mm (50.9 in)
- Width: 968 mm (38.1 in)
- Height: 2,187 mm (86.1 in)
- Weight: 2,199 kg (4,847 lbs)

- **Powerpack Inverter**

- Length: 1,044 mm (41.1 in)
- Width: 1,394 mm (54.9 in)
- Height: 2,191 mm (86.2 in)
- Weight (max): 1,120 kg (2,470 lbs)



\$172,000 per powerpack – but cheaper in quantity!
16,000 powerpacks – \$2.75 Billion minus quantity discount.
Only \$140,000 per customer – (plus the solar panels)

TESLA | Commercial Solar

The image is a screenshot of the Tesla Commercial Solar website. On the left, a large white Tesla Powerpack unit is shown on a rooftop solar array, highlighted with a red border. To the right, the website's pricing and configuration options are visible. A red arrow points from the Powerpack unit to the 'Add 1 Powerpack' checkbox, and another red arrow points from the checkbox to the '\$172,707' price tag in the 'Due Today' section.

Size Guide | Available only in California

Subscribe Buy

40 kW Solar Panels
\$126,596*

40 kW 120 kW 240 kW

Estimated 25 year savings \$482,000

Add 1 Powerpack
232 kWh for backup and peak shaving

Estimated return of 8% to 12% per year. Higher if utility prices increase

Potential Incentives* Hide Show

Due Today \$100

Fully refundable

Solar Panels \$88,660

1 Powerpack \$172,707

Federal Tax Credit

Pacific Gas & Electric

Self Generation Incentive Program(SGIP) -\$66,816

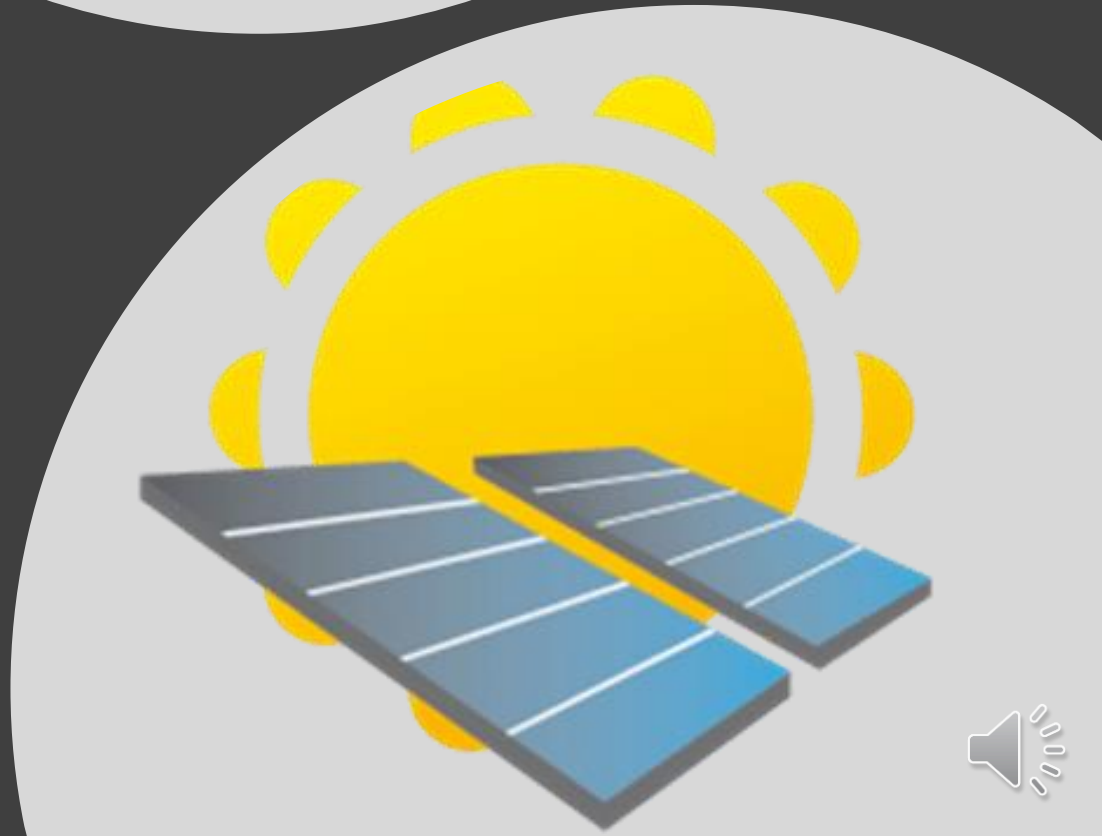


Solar and Battery Systems

- A good start but doesn't get us all the way to zero CO2
- Better batteries would make solar a lot more attractive

- Solar Electricity --
- Diffuse energy source needs to be collected and stored
- Peak demand comes when panels are least efficient

- Li Batteries --
- New technology, limited experience at utility scale
- Can hold a charge for a limited time
- Expensive
- Materials are limited, Co and Li



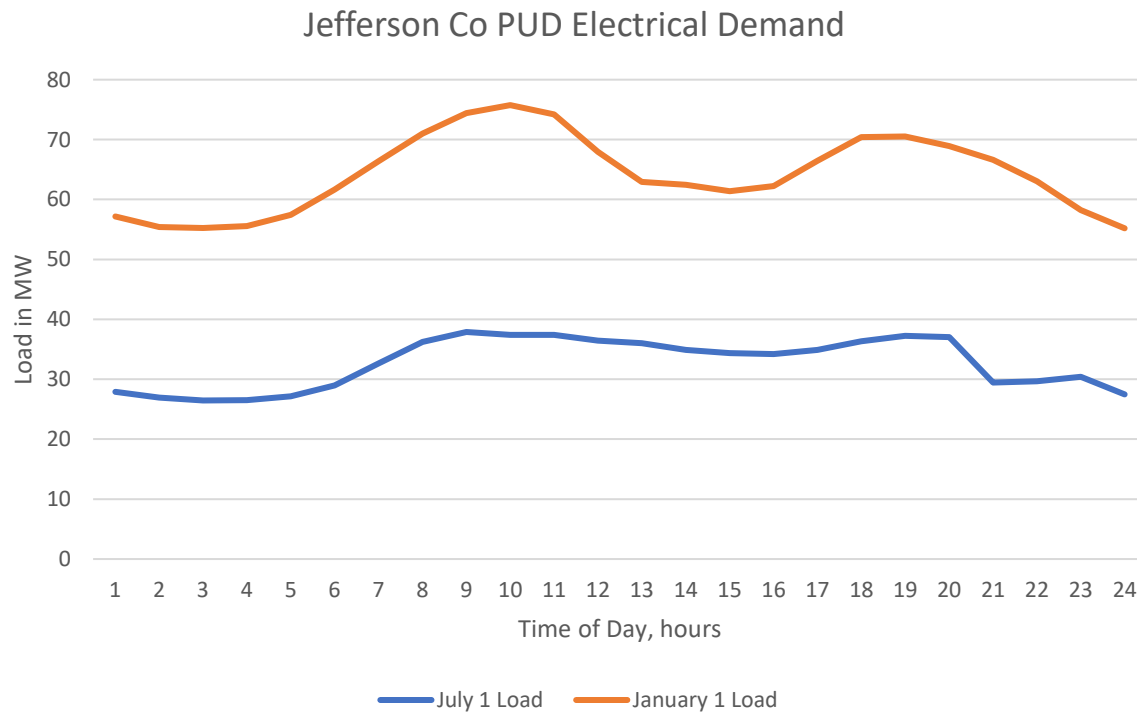
**What happens when you add solar panels to the grid
without batteries, or other storage capacity?**



Vex

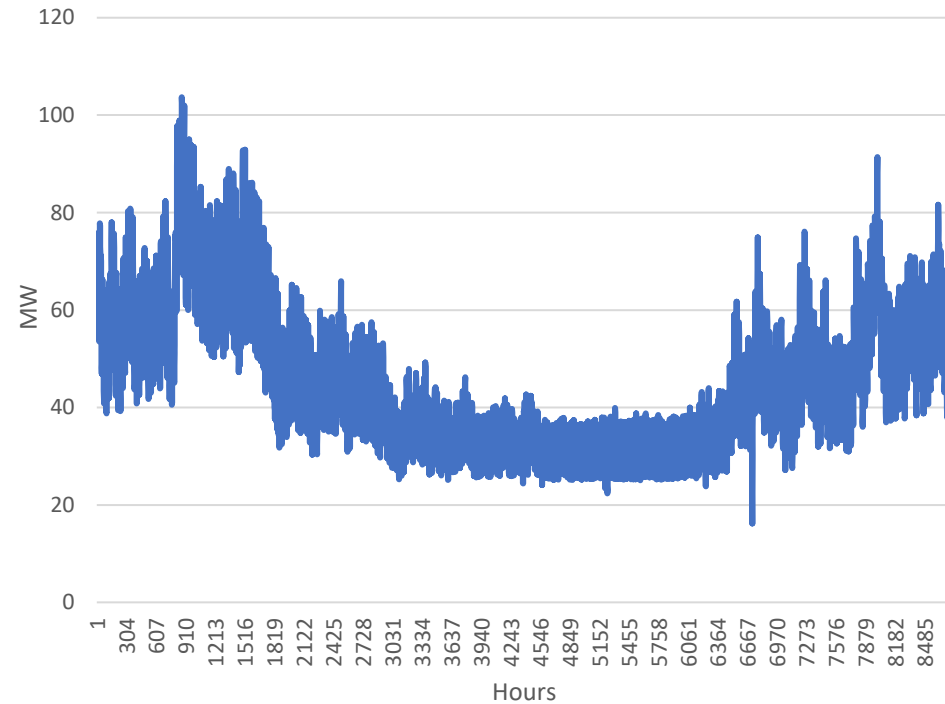


Variation in demand over a 24 hour period – winter vs. summer



Yearly demand variation – Jan 1 is at left margin, Peak demand in February, minimum is July

Electric Usage 2019
Jefferson Co. PUD



Month	Peak (MW)	Energy (MWh)
Jan-19	82	42,813
Feb-19	104	45,874
Mar-19	93	38,982
Apr-19	66	30,645
May-19	53	26,480
Jun-19	46	24,077
Jul-19	43	24,343
Aug-19	40	24,045
Sep-19	59	24,703
Oct-19	76	32,674
Nov-19	91	35,505
Dec-19	82	41,498
Total		391,638
Annual Peak	104	
	45 average MW over the year	
	16 minimum demand	
	104 maximum demand	
Equivalent energy from fossil fuel	48,171	tons of coal
		481 train car loads
	626,621	barrels of oil
	26,318,086	gallons of oil
	2,393	large tank trucks

Jefferson Co.
PUD – Electric
Power
demand, 2019

If we
generated
power using
coal or oil,

How much
fuel would it
take?

We really
benefit from
Bonneville!

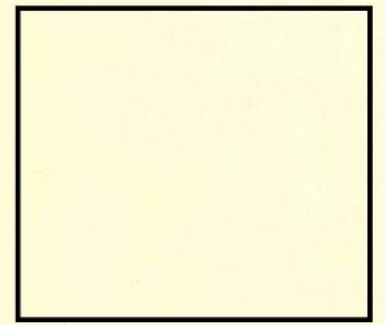




□
300 MW reactor



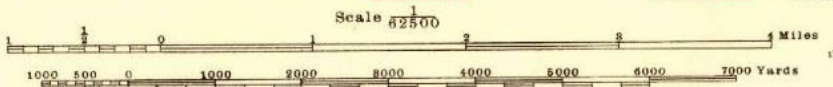
Solar panels, average



Solar panels, max.

(Mt. Constance)
1:125,000

Prepared under the direction of the Chief of Engineers,
U. S. Army, 1936.
Horizontal control by U. S. Coast and Geodetic Survey,
1934 and 29th Engineers, U. S. Army, 1936.
Vertical control by U. S. Coast and Geodetic Survey,



124°	1740					120°
07	17	27	37	47	57	67
06						76
05						75

(Port Gambitz)