

SOLAR + ENERGY STORAGE

### Real Value of Net Energy Metering In California by Tom Rust trust@custompowersolar.com



### The Misinformation

- Misinformation:
- NEM customers are costing noncustomers \$
- Truth:

 NEM customers are subsiziding non-customers, and make the utilities \$ on their exported power



### Independent Research

- A review of the value of solar methodology with a case study of the U.S. VOS<sub>1</sub>
- The median value of NEM solar is \$0.30/kwh – far more than ANY utility pays for NEM solar
- Result: Utilities are making \$ from NEM customers

<sup>1</sup>https://digitalcommons.mtu.edu/michigantech-p/14539/



# Getting to 100% renewables • We cannot get to 100% renewables without energy storage, and we currently have far less storage than solar Solar+Storage Wind+Storage



# Net Energy Metering 1.0

### • Promise:

 The value of power sent back to the grid = the same value of power taken from the grid

• Reality:

 Close, but additional charges incurred – interconnect, and monthly charges (about \$10/month)



## Net Energy Metering 2.0

### • Promise:

 The value of power sent back to the grid = the same value of power taken from the grid – minus Fixed \$/kwh Non Bypassable Charges (NBC) of roughly \$0.027/kwh



## Net Energy Metering 2.0

### • Reality:

 Additional charges include – interconnect, monthly charges (about \$10/month for residential), NBCs (roughly \$0.027/kwh), PCIAs (roughly \$0.03/kwh), IOU value of generation credits does not necessarily = CCA credits (mismatch can be as much as \$0.03/kw), plus city and state taxes



## Net Energy Metering 2.0

- Reality:
- Worse case IOUs shifted from peak rates 12-6pm to 4-9pm, cutting the value of solar generation as much as 40%



### **NEM Physical Reality**

- Example residential customer:
- During a May day, customer generates as much as 5kw peak solar power, 20kwh energy
- Typical load will range from 0.2 to 1kw, during the day, 3kwh will go to loads.
  17kwh is exported to grid



### **NEM Physical Reality**

- Under NEM 1, customer receives full retail value average of \$0.22/kwh credit = \$3.74 credit paid to customer from IOU
- The 17kwh exported to grid is being used by customers immediate neighbors to power THEIR loads.
- Neighbors average rate plan as customer – they receive \$3.74 of "free" power from customer



### **NEM Physical Reality**

- So IOU credits NEM customer \$3.74, and neighbor pays IOU \$3.74 for power actually generated by customer – net zero.
- But wait, IOU now does not need to pay system generation cost, transmission costs, distribution costs, ancillary services, losses, green house gas costs and all the costs included in Avoided Cost Calculations<sup>2</sup> for that 17kh.
- IOU SAVES Avoided costs (which includes generation charges and is TOU dependent, can be high as \$0.49/kwh, average is \$0.126/kwh) \*17kwh=\$2.14 in profit from NEM customer

<sup>2</sup>Avoided Cost Calculator Model 2020, year 2022 – 10 year levelized – CPUC



### NEM 2.0 Physical Reality

- Under NEM 2.0, the "additional" costs IOUs are charging, Fixed meter charges, NBCs and PCIAs, are in reality ADDITIONAL PROFIT IOUs are making(saving) for every kwh exported.
- So now IOUs make meter charges (\$0.02/kwh) + NBCs (\$0.027/kwh) + PCIAs (\$0.04/kwh) + Avoided costs<sup>2</sup> (which includes generation charges and is TOU dependent, can be high as \$0.49/kwh, average is \$0.126/kwh) = \$0.213/kwh

<sup>2</sup>Avoided Cost Calculator Model 2020, year 2022 – 10 year levelized – CPUC



### NEM 2.0 Truth

 Under NEM 2.0, IOUs are SAVING MORE THAN \$0.213/kwh from NEM customers for every kwh exported.



### NEM 2.0 Truth

 This also holds true for the energy costs avoided by NEM customers self-supplying their loads – so they SAVE the IOUs all the Avoided Costs, AND still pay the meter charges – so value is \$0.126 (ACC savings) + meter charges (\$0.02/kwh) = \$0.146/kwh



### NEM 3.0 ACC

 Under the proposed NEM 3.0 ACC, there will be an INCREASE in GHG emissions to 2030, in direct violation of the required 40% reduction in emissions from state mandated SB32

Figure 19. CAISO Projected Emissions Intensity, 2019 IRP Preliminary Results 46 MMT Case



**CAISO Projected Emissions Intensity** 

As the RSP provides retail sales and GHG emissions through 2030, a linear progression was assumed between these 2030 values and the 2045 SB100 goals to estimate emissions intensity at that end-year.<sup>18</sup>



- NEM customers charged same rate as everyone else who uses the grid for imports - TOU retail rates
- Utility pays NEM customer for exports retail TOU rate+Avoided Cost savings<sup>2</sup> for that period
- Ex: During peak, \$0.48/kwh (retail rate) +\$0.38/wkh(ACC savings)

<sup>2</sup>Avoided Cost Calculator Model 2020, year 2022 – 10 year levelized – CPUC



- Export rate justification:
- Neighbors are paying utility at full retail rate of power generated by NEM customers (A)
- Utility saves avoided cost<sup>2</sup> from the generated power (B)
  Utility should pay NEM customer A+B

<sup>2</sup>Avoided Cost Calculator Model 2020, year 2022 – 10 year levelized – CPUC



- Following slides show ACC<sup>3</sup> value based on current EV2 TOU schedule (4-9pm Peak) for both summer (4 months) and winter
- Compare EV2 (residential solar+storage), B-10 (new small commercial rate), and Avoided Cost Calculator values for selected starting years and different levelizing periods
   <sup>3</sup>Avoided Cost Calculator Model 2020 – CPUC



- Since preparing this, in May 2021 a new ACC was released, dramatically changing values – especially for solar generation periods but all off-peak periods.
- Following slides compare the 2020 and 2021 ACC results.



#### Avoided Cost Rate Calculated Schedule – 2022 20 year levelized costs<sup>3</sup>

	Input Summer Rates				Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC
Peak	\$0.48179	\$0.27436	\$0.38306	Peak	\$0.35467	\$0.19808	\$0.13951
Part Peak	\$0.37130	\$0.21267	\$0.21284	Part Peak	\$0.33798	\$0.00000	\$0.10975
Off Peak	\$0.16928	\$0.18010	\$0.09253	Off Peak	\$0.16928	\$0.16260	\$0.08896

#### Avoided Cost Rate Calculated Schedule – 2022 20 year levelized costs<sup>4</sup>

	Input Summer Rates				Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC
Peak	\$0.48179	\$0.27436	\$0.30039	Peak	\$0.35467	\$0.19808	\$0.13995
Part Peak	\$0.37130	\$0.21267	\$0.13412	Part Peak	\$0.33798	\$0.00000	\$0.07255
Off Peak	\$0.16928	\$0.18010	\$0.04632	Off Peak	\$0.16928	\$0.16260	\$0.04658

Based on EV2 TOU rate periods – peak 4-9pm

<sup>3</sup>Avoided Cost Calculator Model 2020 – CPUC

<sup>4</sup>Avoided Cost Calculator Model 2021 – CPUC



We propose this schedule be used, as it best represents costs including GHG goals Avoided Cost Calculated Rate Schedule – Year 2030 10 year levelized cost<sup>3</sup>

	Input Summer Rates				Input Winter Rates		
	EV2 B-10 ACC			EV2	B-10	ACC	
Peak	\$0.48179	\$0.27436	\$0.48240	Peak	\$0.35467	\$0.19808	\$0.26209
Part Peak	\$0.37130	\$0.21267	\$0.35373	Part Peak	\$0.33798	\$0.00000	\$0.20451
Off Peak	\$0.16928	\$0.18010	\$0.17209	Off Peak	\$0.16928	\$0.16260	\$0.16938

Avoided Cost Calculated Rate Schedule – Year 2030 10 year levelized cost<sup>4</sup>

	Input Summer Rates				Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC
Peak	\$0.48179	\$0.27436	\$0.32442	Peak	\$0.35467	\$0.19808	\$0.17810
Part Peak	\$0.37130	\$0.21267	\$0.14756	Part Peak	\$0.33798	\$0.00000	\$0.09828
Off Peak	\$0.16928	\$0.18010	\$0.05202	Off Peak	\$0.16928	\$0.16260	\$0.05910

Based on EV2 TOU rate periods – peak 4-9pm <sup>3</sup>Avoided Cost Calculator Model 2020 – CPUC <sup>4</sup>Avoided Cost Calculator Model 2021 – CPUC



Avoided Cost Calculated Rate Schedule – Year 2040 10 year levelized cost<sup>3</sup>

	Input Summer Rates				Inp	Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC	
Peak	\$0.48179	\$0.27436	\$0.86469	Peak	\$0.35467	\$0.19808	\$0.50616	
Part Peak	\$0.37130	\$0.21267	\$0.69039	Part Peak	\$0.33798	\$0.00000	\$0.40433	
Off Peak	\$0.16928	\$0.18010	\$0.34592	Off Peak	\$0.16928	\$0.16260	\$0.34286	

#### Avoided Cost Calculated Rate Schedule – Year 2040 10 year levelized cost<sup>4</sup>

	Input Summer Rates				Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC
Peak	\$0.48179	\$0.27436	\$0.52840	Peak	\$0.35467	\$0.19808	\$0.33221
Part Peak	\$0.37130	\$0.21267	\$0.23095	Part Peak	\$0.33798	\$0.00000	\$0.18948
Off Peak	\$0.16928	\$0.18010	\$0.10566	Off Peak	\$0.16928	\$0.16260	\$0.11992

Based on EV2 TOU rate periods – peak 4-9pm <sup>3</sup>Avoided Cost Calculator Model 2020 – CPUC <sup>4</sup>Avoided Cost Calculator Model 2021 – CPUC



#### Avoided Cost Caclulated Rate Schedule – Year 2050 1 year levelized cost<sup>3</sup>

	Input Summer Rates				Input Winter Rates		
	EV2 B-10 ACC			EV2	B-10	ACC	
Peak	\$0.48179	\$0.27436	\$1.43567	Peak	\$0.35467	\$0.19808	\$0.73932
Part Peak	\$0.37130	\$0.21267	\$1.28030	Part Peak	\$0.33798	\$0.00000	\$0.59338
Off Peak	\$0.16928	\$0.18010	\$0.50805	Off Peak	\$0.16928	\$0.16260	\$0.50490

#### Avoided Cost Caclulated Rate Schedule – Year 2050 1 year levelized cost<sup>4</sup>

	Input Summer Rates				Input Winter Rates		
	EV2	B-10	ACC		EV2	B-10	ACC
Peak	\$0.48179	\$0.27436	\$0.73454	Peak	\$0.35467	\$0.19808	\$0.47819
Part Peak	\$0.37130	\$0.21267	\$0.33362	Part Peak	\$0.33798	\$0.00000	\$0.27441
Off Peak	\$0.16928	\$0.18010	\$0.15355	Off Peak	\$0.16928	\$0.16260	\$0.17512

Based on EV2 TOU rate periods – peak 4-9pm <sup>3</sup>Avoided Cost Calculator Model 2020 – CPUC <sup>4</sup>Avoided Cost Calculator Model 2021 – CPUC



# CARE and Low income customers

- Imports should be at a discounted rate as they are now.
- Exports should be at FULL retail rate value + ACC credits
- This would add considerable incentives for solar/storage for this customer class.



- Misinformation:
- NEM customers are being subsidized by non-NEM customers
- Truth:

 The opposite – IOUs save \$ off of NEM customers – average of \$0.213/kwh for all exports, \$0.146/kwh for all energy selfconsumed.



- Misinformation:
- IOUs are losing \$ to NEM customers
- Truth:
- The opposite IOUs save \$ off of NEM customers – average of \$0.213/kwh for all exports, \$0.146/kwh for all energy selfconsumed.



- Misinformation:
- IOUs are losing \$ due to NEM customers
- Truth:
- PG&E in particular had \$11 Billion<sup>4</sup> in wildfire related claims (losses) in EACH YEAR 2018, 2019 – these costs are being passed to ratepayers over time due to their negligence

<sup>4</sup> PG&E 2019 Annual report



- Misinformation:
- IOUs are losing \$ due to NEM customers
- Truth:
- PG&E's operating expenses per customer<sup>5</sup> WERE VIRTUALLY EXACTLY THE SAME over the period 2012-2019, when NEM customers increased



<sup>5</sup> PG&E 2012 to 2019 Annual reports – revenue adjusted to 2019 dollars, wildfire claims not included

- Misinformation:
- IOUs are losing \$ due to NEM customers
- Truth:
- PG&E's revenue per kwh delivered<sup>6</sup> INCREASED over the period 2012-2019, when NEM customers increased



<sup>6</sup> PG&E 2012 to 2019 Annual reports – revenue adjusted to 2019 dollars



- Misinformation:
- Building utility scale solar is cheaper than local solar.
- Truth:

 Avoiding the cost of Generation Capacity, Transmission Capacity, Distribution Capacity, Ancillary Services and Losses BY LOCAL GENERATION saves average \$0.17/kwh<sup>7</sup>

<sup>7</sup> Difference in Avoided Cost Calculator, 2030 20 year levelized cost
 2020 CPUC version



- Levelized Cost of Energy (LCOE) including 5 items above - utility Scale Solar+Storage average \$0.30/kwh (\$1.91/watt PV, \$265/kwh storage, 20 year lifetime – actually lasts longer)<sup>8</sup>
- Levelized Cost of Energy (LCOE) Residential Scale Solar+Storage average \$0.13/kwh (\$4/watt PV, \$500/kwh storage, 20 year lifetime – actually lasts longer)
- \$0.30-\$0.13=\$0.17/kwh

<sup>8</sup>Avoided Cost Calculator, 2030 20 year levelized cost 2020 CPUC version





<sup>1</sup> PG&E 2019 Annual report

https://s1.q4cdn.com/880135780/files/doc\_financials/2020/ar/PCG010\_ PGE\_2019-Annual-Report\_Web.pdf

<sup>2</sup>Avoided Cost Calculator Model 2020 – CPUC

https://www.cpuc.ca.gov/general.aspx?id=5267

Excel model: ftp://ftp.cpuc.ca.gov/gopherdata/energy\_division/EnergyEfficiency/CostEffectiveness/2020%20AC C%20Electric%20Model%20v1c.xlsb



### Thank You!

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#### SOLAR + ENERGY STORAGE



### **Distributed Generation**

#### **California Leads the Nation in Distributed Generation**

1,232,564 Solar Projects 10,296 Megawatts (MW) Installed 🕄 10,000 7,500 5.000 2.500 Annual Capacity (MW) Prior Years' Capacity (MW) Data Current Through 2021-01-31

Distributed Generation increased from roughly 1200MW to over 8000MW over the period 2012 to 2019



### **2019 Total System Electric Generation**

Fuel Type	California In- State Generation (GWh)	Percent of California In- State Generation	Northwest Imports (GWh)	Southwest Imports (GWh)	Total Imports (GWh)	Percent of Imports	Total California Energy Mix (GWh)	Total California Power Mix
Coal	248	0.12%	219	7,765	7,985	10.34%	8,233	2.96%
Natural Gas	86,136	42.97%	62	8,859	8,921	11.55%	95,057	34.23%
Oil Other (Waste	36	0.02%	0	0	0	0.00%	36	0.01%
Heat / Petroleum Coke)	411	0.20%	0	11	11	0.01%	422	0.15%
Nuclear	16,163	8.06%	39	8,743	8,782	11.37%	24,945	8.98%
Large Hydro	33,145	16.53%	6,387	1,071	7,458	9.66%	40,603	14.62%
Unspecified	0	0.00%	6,609	13,767	20,376	26.38%	20,376	7.34%
Non- Renewables and Unspecified Totals	136,139	67.91%	13,315	40,218	53,533	69.32%	189,672	68.30%
Biomass	5,851	2.92%	903	33	936	1.21%	6,787	2.44%
Geothermal	10,943	5.46%	99	2,218	2,318	3.00%	13,260	4.77%
Small Hydro	5,349	2.67%	292	4	296	0.38%	5,646	2.03%
Solar	28,513	14.22%	282	5,295	5,577	7.22%	34,090	12.28%
Wind	13,680	6.82%	9,038	5,531	14,569	18.87%	28,249	10.17%
Renewables Totals	64,336	32.09%	10,615	13,081	23,696	30.68%	88,032	31.70%
System Totals	200,475	100.00%	23,930	53,299	77,229	100.00%	277,704	100.00%



### Current Solar+Storage 2020

- Peak 15.5 Gw Solar CAISO grid tied FTM
- Estimated 9.8Gw Solar NEM BTM 14,700 Gwh energy produced per year.
- 4.2Gw of storage, but vast majority of that is hydro
- 216Mw of battery storage to increase to 923Mw by end of 2020
- Even at 1Gw, that is less than 1/50<sup>th</sup> of what is needed to balance the existing solar generation
- We need at least 50Gwh more storage just to offset the existing solar