The Value of Solar

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Everything we can find about the Value of Solar is at http://voscoe.pace.edu

The Ideal Distributed Solar Tariff

- Fair to the utility and non-solar customers
- Fair compensation to the solar customer
- Decouple compensation from incentives
- Align public policy goals (e.g., decouple compensation from consumption)
- Intuitively sound and administratively simple

Historical Antecedents

- PURPA (US Public Utility Regulatory Policy Act of 1978)
- Externalities
- Price ≠ Cost≠ Value
- Green Power
- *Small Is Profitable* (*http://www.smallisprofitable.org/*)
- Local Integrated Resource Planning

Heat, but Not Much Light

- EEI claims: “Net Metering . . .
  - Subsidizes solar customers
  - Subsidizes the rich at the expense of the poor
  - Allows solar customer to avoid fixed costs”
- No cost of service studies to support these assertions in any case where these arguments have been made
- No valuation analysis

“In God we trust, all others must bring data.”

Real Issues with Traditional Net Metering

- PURPA legacy
- No direct relationship between retail rates and solar value
- *Accounting* under-recovery for the utility
- Impacts between rate cases (accounting, forecasting, regulatory lag, historic test year)
- Under-compensation for solar offset & excess energy
  - Reduces optimal investment size
  - Encourages consumption during periods of solar production
- Monthly true-up leads to sub-optimal system size; sub-optimal investment per install
- Perverse results with tiered or time-of-use rates

Solar Value: Analytical Approach

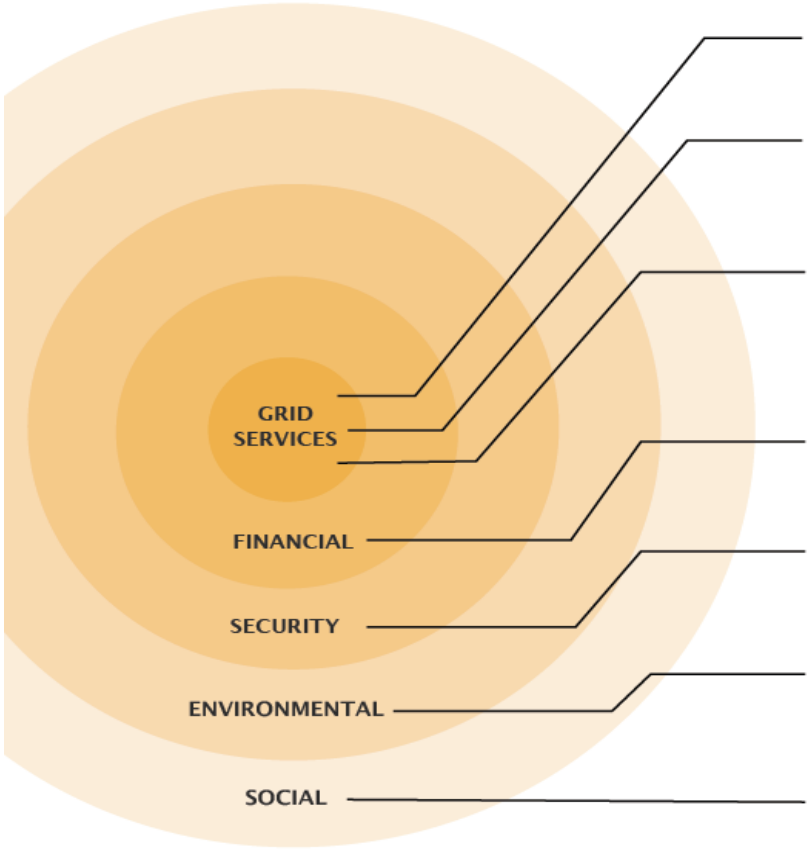
- Critical policy/tax issue: Production for USE or for SALE?
- Customer/community investment in solar provides valuable, privately-funded, clean electricity at or very near the point of use.
- If the utility had to provide the same, what would it be worth?

  What is the fair value? ("LMP+D")
- Calculate an "indifference rate," measured at the meter/inverter
- Analysis shows value or "avoided cost" in many categories.
- Integration costs reduce net benefits.
- *Additional* societal value, often >2X+ utility value—for jobs, economic development, local tax revenues, etc.

Solar Value: Analysis-Based

BENEFIT & COST CATEGORIES

For the purposes of this report, **value is defined as net value, i.e. benefits minus costs.** Depending upon the size of the benefit and the size of the cost, value can be positive or negative. A variety of categories of benefits or costs of DPV have been considered or acknowledged in evaluating the value of DPV. Broadly, these categories are:



ENERGY
- energy
- energy losses

CAPACITY
- generation capacity
- transmission & distribution capacity
- DPV installed capacity

GRID SUPPORT SERVICES
- reactive supply & voltage control
- regulation & frequency response
- energy & generator imbalance
- synchronized & supplemental operating reserves
- scheduling, forecasting, and system control & dispatch

FINANCIAL RISK
- fuel price hedge
- market price response

SECURITY RISK
- reliability & resilience

ENVIRONMENTAL
- carbon emissions
- criteria air pollutants (SOx, NOx, PM10)
- water
- land

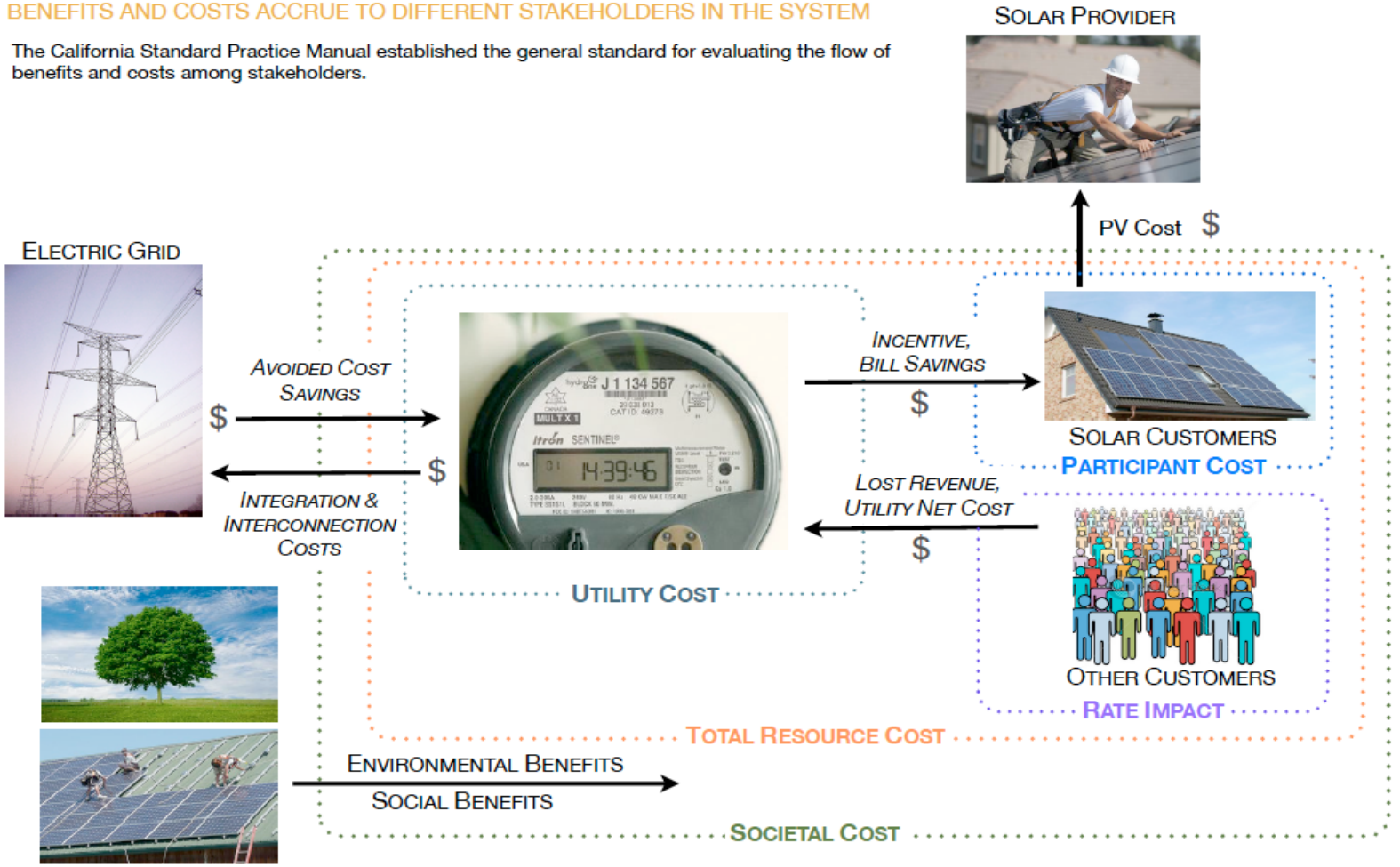
SOCIAL
- Economic development (jobs and tax revenues)

Solar Value: Analysis-Based

FLOW OF BENEFITS AND COSTS

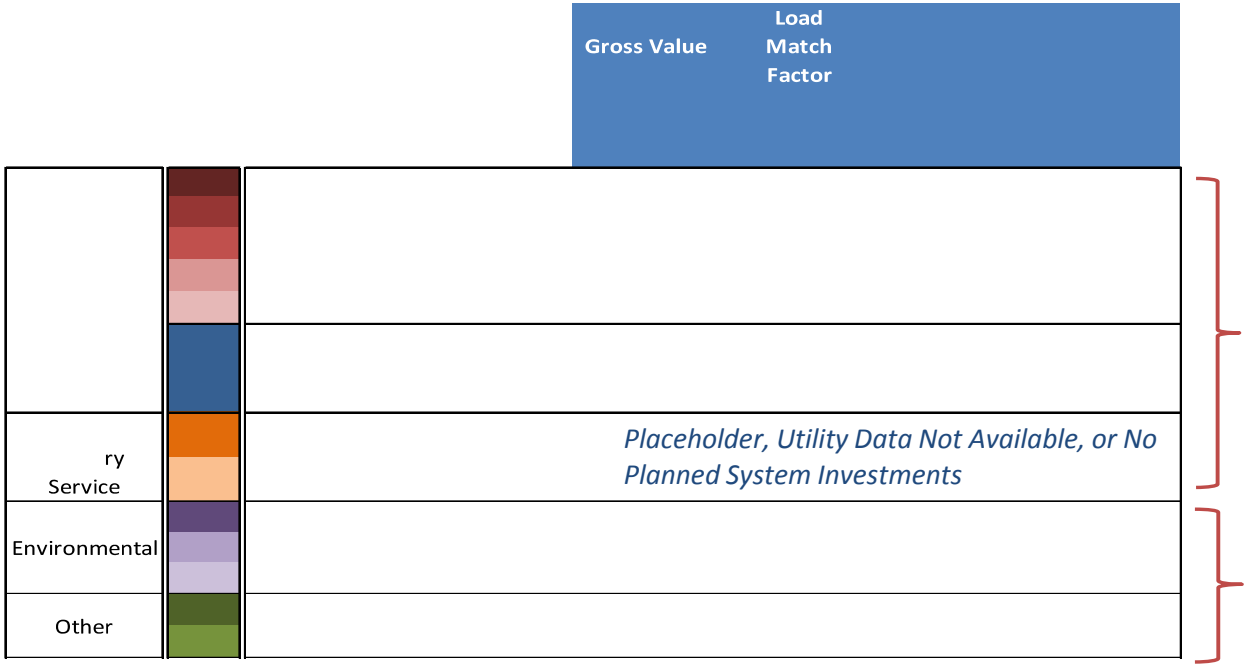
BENEFITS AND COSTS ACCRUE TO DIFFERENT STAKEHOLDERS IN THE SYSTEM

The California Standard Practice Manual established the general standard for evaluating the flow of benefits and costs among stakeholders.



Maine Value of Solar Study

Figure ES- 2. CMP Distributed Value – 25 Year Levelized ($ per kWh)



Gross Values represent the value of perfectly dispatchable, centralized resources. These are adjusted using

- Load Match Factors to account for the non-dispatchability of solar; and
- Loss Savings Factors to account for the benefit of avoiding energy losses in the transmission and distribution systems.

Value of Solar Tariff ("VOST") Two Simple Changes

1. Compensation rate - Change **from**:
   - Retail up to consumption, then something else"

to

   - Annually updated value of solar (present value of 30-year stream) for **ALL** solar generation

2. Network Costs - Calculate bill by charging for gross consumption as if the customer had no solar, then credit **ALL** solar production at the value of solar rate

Net Metering vs. VOST

GC = Gross Consumption

GP = Gross Production

$Rate^{R}$ = Retail Rate*

$Rate^{VOS}$ = Value of Solar Rate

NEM Bill = $(GC - GP) \times Rate^{R}$

or = $(GC \times Rate^{R}) - (GP \times Rate^{R})$

VOST Bill = $(GC \times Rate^{R}) - (GP \times Rate^{VOS})$

* In some jurisdictions, credit rate differs for offset vs. excess production

Billing the Value of Solar Rate

Customer Charge (per customer)	$	
Energy Charge (per total kWh use)		$
Fuel Charge (per total kWh use)	$	
Other Charges		$
Total Charges		$
Value of Solar Credit (per solar kWh)	($)	
Total (net) Bill		
$		

- The solar customer is charged for all energy consumption as if the customer did not have a solar system. This ensures that utility cost of service is always covered, regardless of solar system performance.
- The solar customer is credited for all solar generation at the annually adjusted VOS rate, empirically derived, based on actual values.
- The customer pays any net charges, carries over net credits to the next month, for 1 year.
- All credits remaining at the end of the year are zeroed out. (tax issue)
- The utility accounts for the difference between the charges and the credits through the fuel factor.

Major Benefits of VOS Approach

- Reduces or eliminates arguments about class subsidies
- Explicitly charges for consumption; keeps utility whole on cost of service (some utility upside due to conservative calculation approach)
- Incentive for efficiency
- Frequent adjustment reduces over- or under- payment as utility costs change
- Better aligns with sound rate making principles
- Reduces simple payback; reduces pressure on incentives
- No less financeable than net metering
- No reasonable risk of tax consequences

Beyond Value of Solar

A Foundation for New Rates that Reduce Subsidies, Support Innovation, and Target Investments

- Value of Storage - Stationary, and soon, the electric vehicle kind (operating in V-to-Grid settings)
- Value of Smarts - smart inverters, home, local grids, substations and feeders
- Value of Security - smart, self-healing, storm-resistant, secure grids and micro grids
- Value of Savings - customer or utility controlled curtailable and shape-able loads interacting in dynamic curtailment markets

Thanks!

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