Valuing Clean Distributed Energy

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Distributed Energy Resources

- “DER”
- Generation, demand response, efficiency, storage, electric vehicles, etc.
- Embedded in the distribution system
- “Smaller” in scale
- Often, “behind the meter”
- Can be provided by “3d parties”
- 2-way, 3-way transactions

Responses to DER

- Prohibition vs. mandates
- Regulation (define as “utility,” or not)
- Extra charges vs. extra incentives
- Eliminate benefits vs. incentives
- New services from utilities vs. others
- Technical, regulatory, economic - internalization vs. bypass
- Utility transformation

Cost of Service Ratemaking

- Properly set retail rates =
  - Cumulated costs to provide delivered kWh @ meter
  - Plus, a margin (for profit, debt service coverage, etc.)
- A kWh of energy produced at or very near the point of consumption avoids all the costs reflected in proper cost-based rates, plus:
  - Customer bears financing, insurance, and operational risk
  - Renewable energy is drought-proof; carbon-proof; not subject to price volatility
  - Excess will, according to physics, serve the nearest unserved load; often higher-than-average value

Net Metering

- It is illogical to assert that net metering creates a subsidy without a cost-of-service or valuation study to prove it
- Net metering does not allow the customer to "avoid" distribution charges, only "offset" – a very big difference
- Valuation studies in CO, CA, NV, MS, WI, TX, MN, NC, AZ, ME, MO show that net metering results in solar customers subsidizing the utility

Net Metering

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

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

where: GC = Gross Consumption

GP = Gross Production

$Rate^R$ = Retail Rate

(in some places, differential for offset vs. excess production

Net Metering Issues

- PURPA legacy
- Relationship between retail rates and solar value
- ***Accounting*** under-recovery for the utility, impacts between rate cases
- Low payments 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 rates

Why Value-Based?

- Price ≠ value; price ≠ cost
- Economic efficiency, price signals
- Decoupling
  - Incentives from compensation
  - Compensation from consumption
- To “animate” DER markets
- For Solar, Savings, Storage, Smarts, and Security

Compensation & Incentives

- Compensation should be fair rate for value received
  - *In God We Trust . . All others bring data*
- Incentive should support policy preferences and be scaled to overcome market failures
  - *The "Goldilocks" test*
- Both are more easily managed apart

Ideal Solar Programs

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

Core Objective of Solar Valuation

- “Rates and services in the public interest" that support:
  - Economic efficiency
  - Societal equity
  - Technological innovation
- “Cost of Service” - Quantitatively assess benefits and costs to the utility, utility customers, and society
- Establish the economic indifference value at which the utility can compensate the customer, or make and deliver the service themselves
- Rates should be based on data and analysis, not suppositions

Value of Solar Analysis Tool

- Developed in 2006 with help from Clean Power Research
- First used to benchmark IPP offers and PPA pricing
- Then used to benchmark commercial PBR (performance based rate)
- Covered energy, capacity, T&D, fuel price volatility, environmental for utility analysis
- Separate study characterized jobs and other economic development benefits (not everything belongs – hard to quantify, better venues)

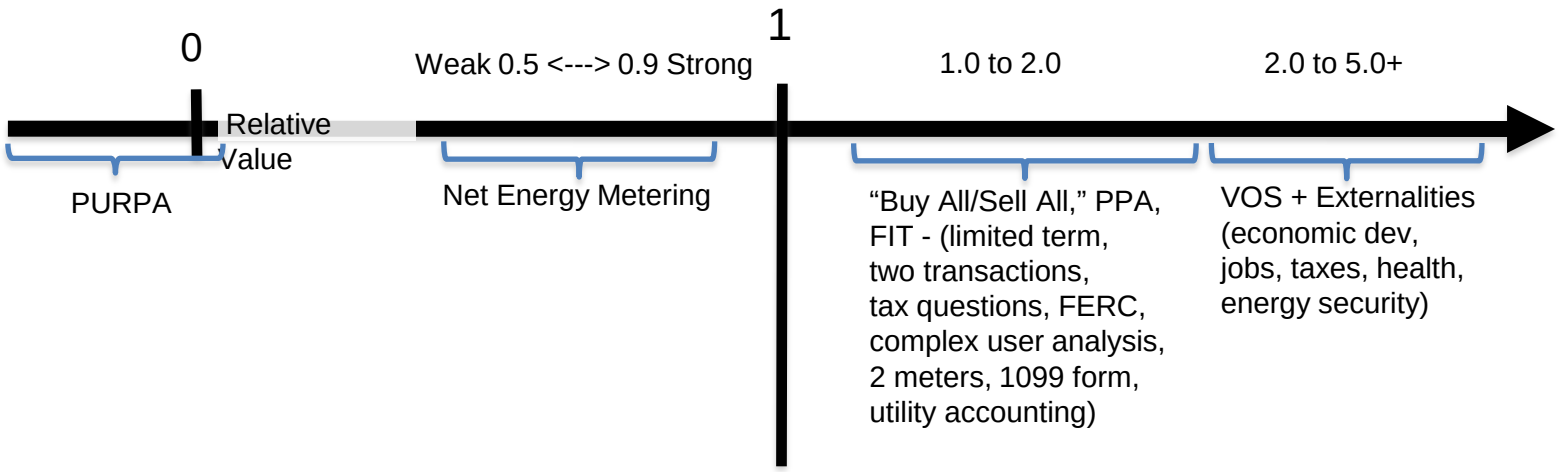
Solar Value: Analytical Approach

- When a customer and the community invest in solar, it provides valuable, privately-funded, clean electricity—at or very near the point of use. (Customer capital at risk)
- If the utility had to provide that same quality electricity, what would it be worth? What is the fair ***value***?
- Analysis shows value or avoided expenses for:
  - Electric energy and capacity
  - Transmission & distribution (energy & capacity)
  - Line losses (transmission & distribution)
  - Fuel price hedging (cost to maintain stable fuel prices)
  - Environmental value (non-fossil, carbon-free, "waterproof")
- Analysis shows additional societal value, often >2X utility value, for jobs, economic development, local tax revenues, etc.

Determining the VOS Value

- Cumulative and long-term avoided cost
  - Like resource planning valuation
  - LCOE, adjusted for load match (intermittence), line losses, and risk
  - Conservative, known, and measurable
- Derives an energy value, so customer bears risk of non-performance
- Can set compensation separately from incentive levels, allowing better management of both

Solar Price Continuum vs. Value



Sample Solar Valuation - Maine

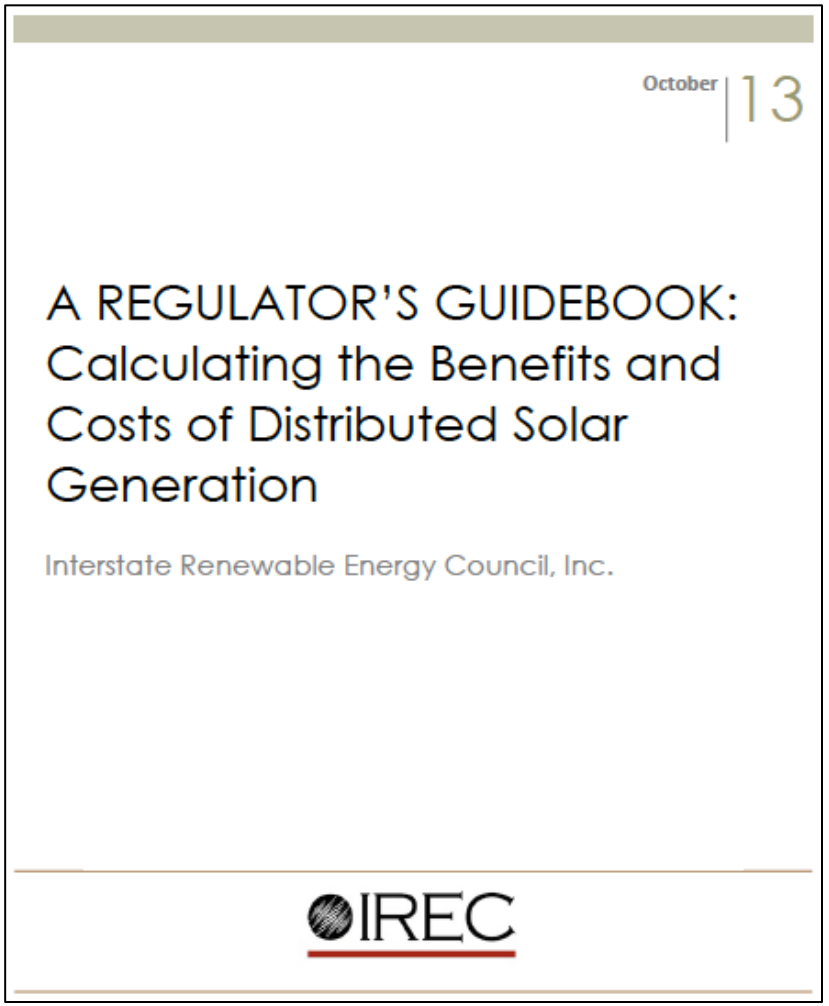
Figure ES- 2. CMP Distributed Value – 25 Year Levelized ($ per kWh)

25 Year Levelized		Gross Value A ($/kWh)	×	Load Match Factor B (%)	×	Loss Savings Factor (1+C) (%)	=	Distr. PV Value D ($/kWh)	
Energy Supply	Avoided Energy Cost	$0.076				6.2%		$0.081	Avoided Market Costs
	Avoided Gen. Capacity Cost	$0.068		54.4%		9.3%		$0.040	
	Avoided Res. Gen. Capacity Cost	$0.009		54.4%		9.3%		$0.005	
	Avoided NG Pipeline Cost								
	Solar Integration Cost	($0.005)				6.2%		($0.005)	
Transmission Delivery Service	Avoided Trans. Capacity Cost	$0.063		23.9%		9.3%		$0.016	$0.138
Distribution Delivery Service	Avoided Dist. Capacity Cost								
	Voltage Regulation								
Environmental	Net Social Cost of Carbon	$0.020				6.2%		$0.021	Societal Benefits
	Net Social Cost of SO_2	$0.058				6.2%		$0.062	$0.199
	Net Social Cost of NO_x	$0.012				6.2%		$0.013	
Other	Market Price Response	$0.062				6.2%		$0.066	
	Avoided Fuel Price Uncertainty	$0.035				6.2%		$0.037	
								$0.337	

Distributed Solar Valuation: "A Regulator's Guidebook"

Available through:

http://irecusa.org



Thank you!

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Backup Reference Slides

Why Value-Based Solar?

- Strong customer and community desire for more solar development
- Criticisms of net metering
- Concerns about future revenue shortfalls
- Allegations of cross subsidies
- Evidence of conflation of value and incentive; under-compensation for solar
- Evidence of need for distributed energy resource valuation in general

Net Metering & Value-Based Rates

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

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

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

where:

GC = Gross Consumption

GP = Gross Production

$Rate^{R}$ = Retail Rate

(in some places, differential for offset vs. excess production

Value of Solar in the Austin Rate

- 2-part rate
  - Gross consumption charge
  - Gross production credit
- Benefits
  - Better price signals
  - Keeps utility 100% whole on distribution service costs
  - Eliminates subsidies (except those inherent in class rate)
  - Restores efficiency incentive
  - Improves payback
  - Provides more excess energy during peak sun hours
  - Regular recalculation prevents long-term subsidies or short-falls
  - Self-reducing differential as penetration rates increase
  - Foundation for other distributed energy resources

VOST - Two Simple Changes

- Compensation - 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
- Rate Design - Calculate bill by charging for total consumption as if the customer had no solar, then credit ALL solar production at the value of solar rate (other options possible)

Billing the Value of Solar Tariff

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.

Activity Since VOS Rate Adopted

- Rebates way down, market way up
- Rates appealed to PUCT, case settled, no testimony or evidence raised any issues with the VOS
- Utility has reset value through data updates and methodology changes
- Further tariff structure changes possible
- Some discussion about extending the rate to the commercial sector in Austin
- Some confusion about tax issues

Austin Energy 2013 Report

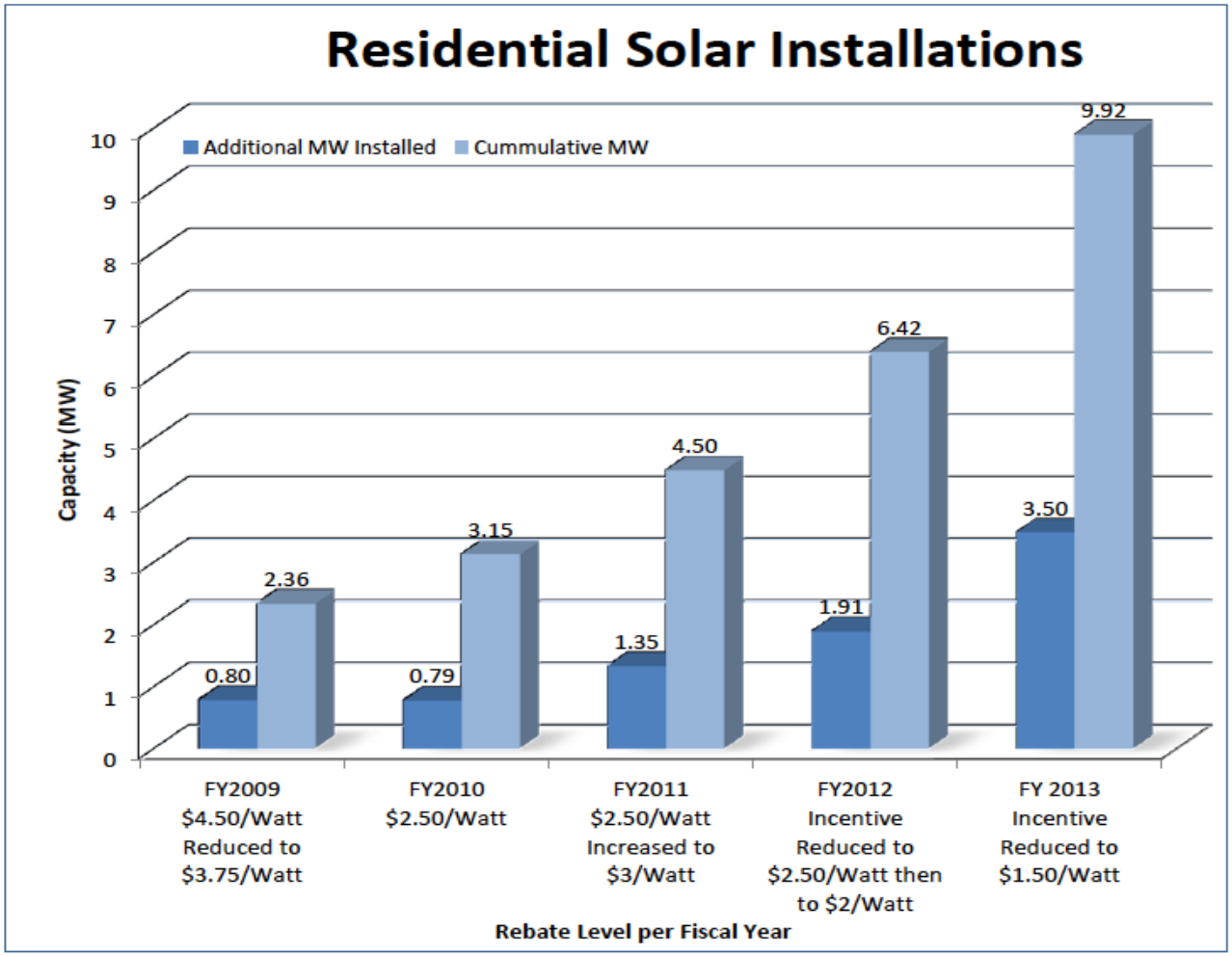
Table 25: Solar Rebate Program

	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Residential (Capacity Based Incentive)					
Rebate Dollars	$4,228,791.48	$3,216,535.05	$4,711,101.25	$5,721,412.02	$7,877,289.00
No. of Rebates	255	213	328	458	719
kW-AC	803.07	793.26	1,352.65	1,913.26	3,503.00
Avg. Rebate per customer	$16,583.50	$15,101.10	$14,363.11	$12,492.17	$10,956.00
Avg. System Size kW-AC	3.15	3.72	4.12	4.18	4.87
$/kW-AC	$5,265.76	$4,054.81	$3,482.86	$2,990.41	$2,249.00

			VOST adopted		
Avg Rebate - $/w	$5.27	$4.05	$3.48	$3.00	$2.25

Austin – Sustained Orderly Market Development

Chart 1: Residential Solar Rebate Program History



More Changes in Austin

http://www.austintexas.gov/edims/document.cfm?id=211789

- 2015 VoS Factor of 11.3 ¢/kwh, effective January 2015
- Eliminate annual sweep of excess credits
  - Excess applicable to customer's other electric services at premise
- Remove 20kW Residential Solar Tariff cap
- Enable leased residential system hosts to receive VoS
- Better stability in VoS rate through smoothing

Link to YouTube

- https://www.youtube.com/watch?v=EIVXysMOuhs