



Synapse
Energy Economics, Inc.

Net Metering and Mississippi

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Value of Solar – with an eye on Mississippi

Value of Solar Components

Utility Avoided Costs

- Energy
- Generation capacity
- T&D capacity
- Line loss avoidance
- Fuel hedge
- Environmental compliance

Other Avoided Costs

- Health impacts
- Economic impacts
- Water impacts
- Other environmental impacts

Value of Solar Components

Utility Costs

- Interconnection
- Intermittency
- Administrative
- PV construction costs (if utility owned)

Other Costs

- Interconnection
- PV construction costs (if not utility owned)

VoS a Function of Installation

- Avoided T&D and line losses not included with utility scale PV installations
- Generating capacity dependent on both tilt and direction of panels
- The value of some components of VoS decline as more MW PV added to system

Net Metering – with an eye on Mississippi

PV Output vs. Load

PV Output < Load

- Looks like EE
- Self-reliance
- Utility doesn't "know" there is PV involved

PV Output > Load

- Not like EE, not merely self-service (now a "customer utility"), utility must directly react to PV's output
- How to bill the surplus?
- Timescale of computation?

Net Metering

Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid.

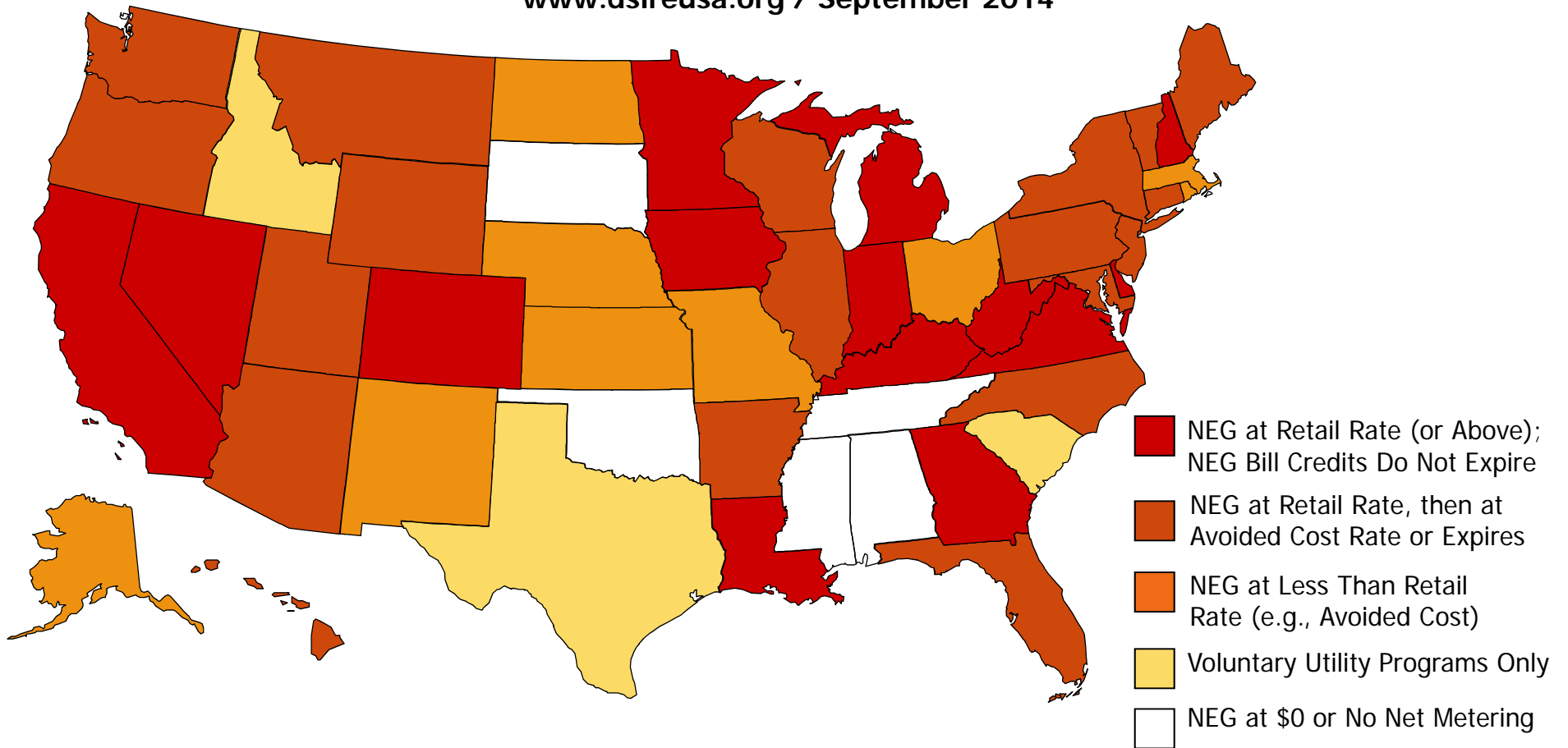
Typically 1:1, calculated each billing cycle.

Net Energy Generation

- 1:1 treatment limited in application to kWh consumed in the billing cycle
- Net energy generation (NEG) is when PV kWh generation exceeds customer consumption in a month.
- Wide variety in state handling of NEG
 - Retail rate credits roll over monthly, indefinitely
 - Retail rate credits expire or pay out after period
 - Pays out at less than retail rate
 - $NEG = \$0$

Handling of NEGs by State

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VoS vs. Net Metering

- Value of Solar is a technique to determine the net benefits solar (DG or utility scale) provides to the utility system.
- Net Metering is ratemaking.

Alternatives to Net Metering

- Prohibit any DG PV from flowing onto the grid
- Calculate NEG instantaneously or hourly instead of monthly
- Buy all, sell all

Final Bits and Bobs

- Mississippi PSC Docket No. 2011-AD-2
- Mississippi has room to grow
 - Solar PV in America: 3,313,000 kW¹
 - Solar PV in Mississippi: 700 kW²

Fn 1: SEIA 2012 Year in Review

Fn 2: 2012 US Solar Market Trends

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Additional Slides

VoS: Avoided Energy

- Calculated with hourly dispatch modeling
- Solar PV avoids the marginal unit
- Requires long term forecast of fuel prices and fleet membership
- Solar PV ramping may require additional dispatch of fast-ramp units
- Pollutants with allowances included in this calculation
- Typically the largest avoided cost

VoS: Avoided Generating Capacity

- Use ELCC to calculate PV's capacity
- Increased PV decreases ELCC, but not significant for low levels of PV
- If utility is long on capacity, valuable to the extent it can be sold to a nearby utility
- Capacity value sources include
 - Regional marketplace (MISO)
 - Net-CONE
 - \$0/kW
 - Blend

VoS: Avoided T&D Capacity

- Only applicable to distributed solar (<5 MW)
- Avoided T&D value sources include:
 - Tx DG avoided cost studies
 - Tx EE avoided cost studies
 - In depth utility study
- Detailed distribution studies much more complex
- Deferring investment (rather than avoiding it) still saves ratepayer money

VoS: Line Loss Avoidance

- Only applies to DG PV
- $Q \propto I^2R$
- Has two components:
 1. The power not sent on the T&D grid doesn't suffer losses
 2. The remaining power on the T&D grid is reduced, and therefore has proportionally less loss
- Must consider PV generation profile

VoS: Carbon Emission Avoidance

- What cost to use for carbon? \$0? SCC? Synapse Low/Mid/High? IRP value?
- How does the forecasted value of carbon change under the Clean Power Plan (aka 111(d))?
- Are there state-specific statutory limitations?
- Mechanics of calculating similar to pollutants with allowances – handled by hourly dispatch modeling
- EPA's *AVERT* tool can be helpful

VoS: Fuel Hedge

- The operating cost of solar is not a function of the price of gas, coal, or carbon – and therefore provides a hedge against changing commodity prices.
- Even if the utility isn't actively hedging its position, this hedge provides value to ratepayers and therefore should be included.
- How to calculate?
 - Adder
 - Black-Scholes
 - NYMEX futures

Utility Owned PV

- Typically >5 MW
- Small number of installations in the region
- Lower cost per MW: \$2/W (SEIA Solar Market Insight Report 2013)
- Doesn't avoid T&D costs
- More susceptible to intermittency and dispatch challenges
- Ratepayers