



Value of Solar Methodology

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Value of Solar Study_AGRPTF Presentation





Value of Solar Review

- First study conducted in 2006 by Clean Power Research, value used internally
- Value has fluctuated historically based on market changes
- Integrated into residential solar tariff in 2012 and reviewed annually
- In July 2013, Clean Power Research was hired again to review the study
- In October 2013
 - CPR presented the study results to the Joint EUC/RMC meeting
 - VoS for 2014 was announced to be effective from Jan 1st, 2014

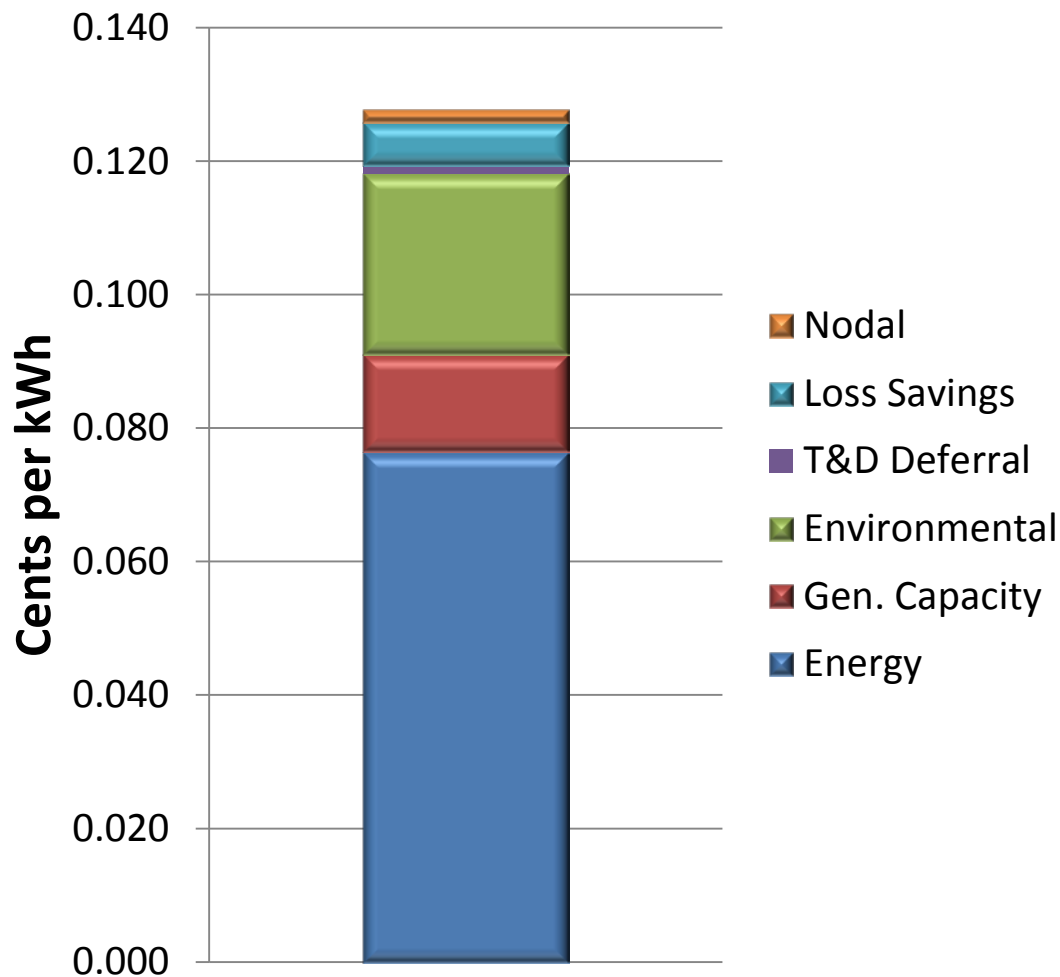


How is the VoS calculated?

Value Component	Basis
Guaranteed Fuel Value	Cost of fuel to meet electric loads and T&D losses inferred from nodal price data & guaranteed future NG prices
Plant O&M Value	Costs associated with operations and maintenance
Generation Capacity Value	Capital cost of generation to meet peak load inferred from nodal price data
Avoided T&D Capacity Cost	Cost of money savings resulting from deferring T&D capacity additions.
Avoided Environmental Compliance Cost	Cost to comply with environmental regulations and policy objectives.



Value of Solar Components



Initial (2012) VoS 12.8 Cents



Approach to Calculate Energy and Capacity Value of PV

Energy Value:

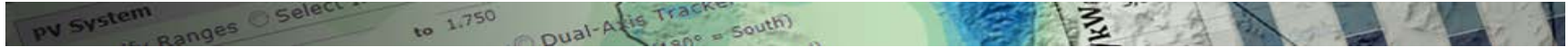
- Obtain implied hourly heat rates from 2014 to 2022
- Match 2011 PV fleet production to 2014 – 2022 hourly heat rates
- Multiply 2011 PV fleet production times 2014 - 2022 heat rates
- Sum results and divide by energy to obtain results in \$/kWh

Capacity Value:

- Implied value of capacity based on avoided cost of a simple cycle gas turbine
 - Capital cost of a simple cycle gas turbine technology is based on EIA Spring 2013 update.



Sample Energy Value Calculation



Nodal Price Value Calculation

HE (CST)	[A] Fleet Energy (MWh)	[B] Nodal Price (\$/MWh)	= [A] x [B] Value (\$)
1/1/2011 6:00	0.000	28.46	0.00
1/1/2011 7:00	0.000	32.39	0.00
1/1/2011 8:00	0.385	34.80	13.38
1/1/2011 9:00	1.953	36.20	70.68
1/1/2011 10:00	4.016	36.97	148.47
1/1/2011 11:00	5.599	34.06	190.71
1/1/2011 12:00	6.587	41.78	275.21
1/1/2011 13:00	6.940	29.13	202.17
1/1/2011 14:00	6.767	32.46	219.66
1/1/2011 15:00	6.037	29.13	175.85
1/1/2011 16:00	4.782	26.90	128.64
1/1/2011 17:00	2.921	27.76	81.08
1/1/2011 18:00	0.895	34.59	30.96
1/1/2011 19:00	0.036	46.81	1.67
1/1/2011 20:00	0.000	44.77	0.00
1/1/2011 21:00	0.000	42.59	0.00

* Repeat calculation for all hours of year and sum result.



VOS Calculation

- Guaranteed Fuel Value

$$= \text{Energy Value} * (1 + \text{Loss factor})$$

Where Energy Value =

$$\frac{\sum(\text{Heat rate} * \text{Gas Price} * \text{PV Production} * \text{Risk Free discount factor})}{\sum(\text{PV Production} * \text{Risk Free discount factor})}$$

- Plant O & M value =

$$\left[\frac{\sum(\text{O \& M Cost} * (1 + \text{Inflation})^{\text{year}} * \text{PV Capacity} * \text{Risk Free discount factor})}{\sum(\text{PV Production} * \text{Risk Free discount factor})} \right] * (1 + \text{Loss factor})$$

- Generation Capacity value =

$$\left[\frac{\sum(\text{Annual Capital carrying cost} * \text{PV capacity} * \text{Risk Free discount factor})}{\sum(\text{PV Production} * \text{Risk Free discount factor})} \right] * \text{load match} * (1 + \text{Loss factor})$$



VOS Calculation Contd...

- Avoided Transmission cost =

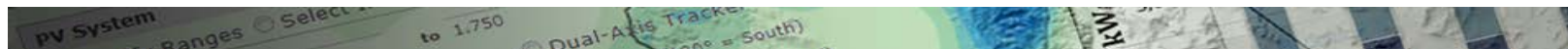
$$\left(\frac{\sum(\text{Transmission cost} * \text{PV capacity} * \text{Risk Free discount factor})}{\sum(\text{PV Production} * \text{Risk Free discount factor})} \right) * \text{load match} * (1 + \text{Loss factor})$$

where Transmission cost is Austin Energy contribution to ERCOT T-Cost

- Avoided Environmental cost = \$0.02/kWh



Key Parameters



Key Parameters for Value of Solar

- Data inferred from Austin Energy's Heat Rate Forecast (2014-2022) and PV fleet production (2011)
 - Solar heat rate: **8,024 Btu/kWh**
 - Effective capacity: **62% of capacity cost**

- Data provided directly by Austin Energy
 - Capacity cost: **\$676/kW**
 - Planning Reserve margin: **13.75%**
 - O&M cost: **\$7.04/kW-yr**



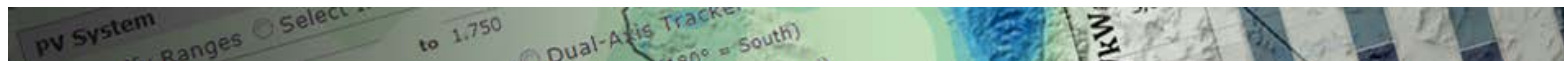
Inferred and Assumed Values

Inputs to Economic Analysis

Utility-Owned Generation			Environmental		
Capacity			Avoided Environmental Cost	\$0.020	per kWh
Generation Overnight Capacity Cost	\$676	per kW	Environmental Value Escalation Rate	2.60%	per year
Generation Life	30	years			
Reserve Planning Margin	13.75%		Transmission		
Energy			Capacity-related capital cost	\$28.0	per kW-yr
Heat Rate	8024	BTU per kWh	Years until new capacity is needed	0	years
Heat Rate Degradation	0%	per year			
O&M cost (first Year) - Fixed	\$7.04	per kW-yr	Distribution		
			Capacity-related Capital Cost	\$0	per kW
Economic Factors			PV Assumptions		
Discount Rate	Various	per year	PV Degradation	0.50%	per year
General Escalation Rate	2.10%	per year	PV Life	25	years

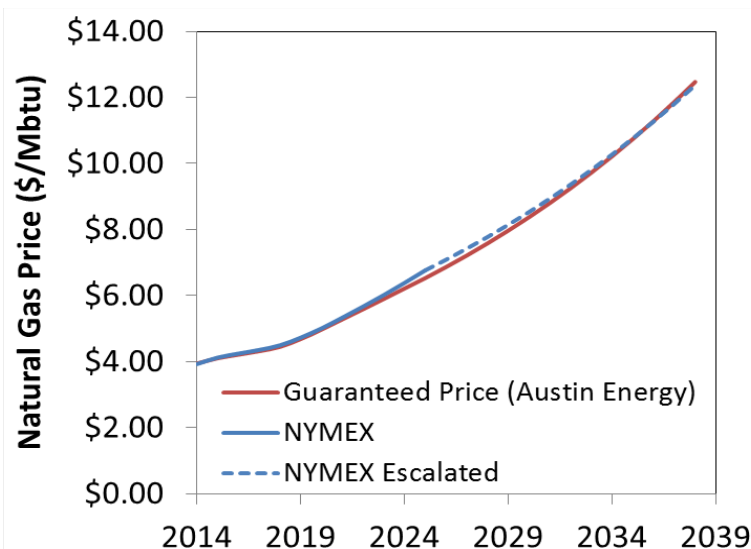


Gas Curve



Key Parameters for Value of Solar Natural Gas Prices

Guaranteed Price (Austin Energy) and NYMEX futures prices match well



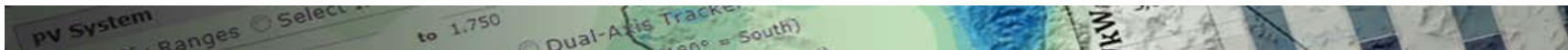
Guaranteed Price (Austin Energy) is a 25-yr firm price quote Austin Energy received from a counter party with AA credit rating on 9/23/2013 willing to lock in prices

NYMEX futures prices are only available through 2025

NYMEX Escalated are futures prices escalated at 4.75% after 2025



Discount Rate

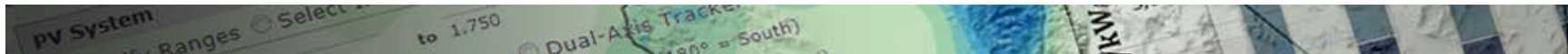


Discount Rate Selection

- Options
 - Use utility discount rate, exclude effect of difference between utility discount rate and risk-free discount rate
 - Use utility discount rate, include effect of difference between utility discount rate and risk-free discount rate
 - Use risk-free discount rate to discount all costs and levelize VOS rate
- Recommendation
 - Use risk-free discount rate to discount all costs and levelize VOS
 - This captures the benefit of uncertainty reduction but eliminates discussion about what is the correct discount rate to use in the analysis because only one discount rate is used
- This assumption may not apply to other typical utility resource evaluations



2014 VOS



2014 VOS Results

	Guaranteed Fuel Value
	Plant O&M Value
	Gen. Capacity Value
	Avoided Trans. Capacity Cost
	Avoided Dist. Capacity Cost
	Avoided Environmental Cost

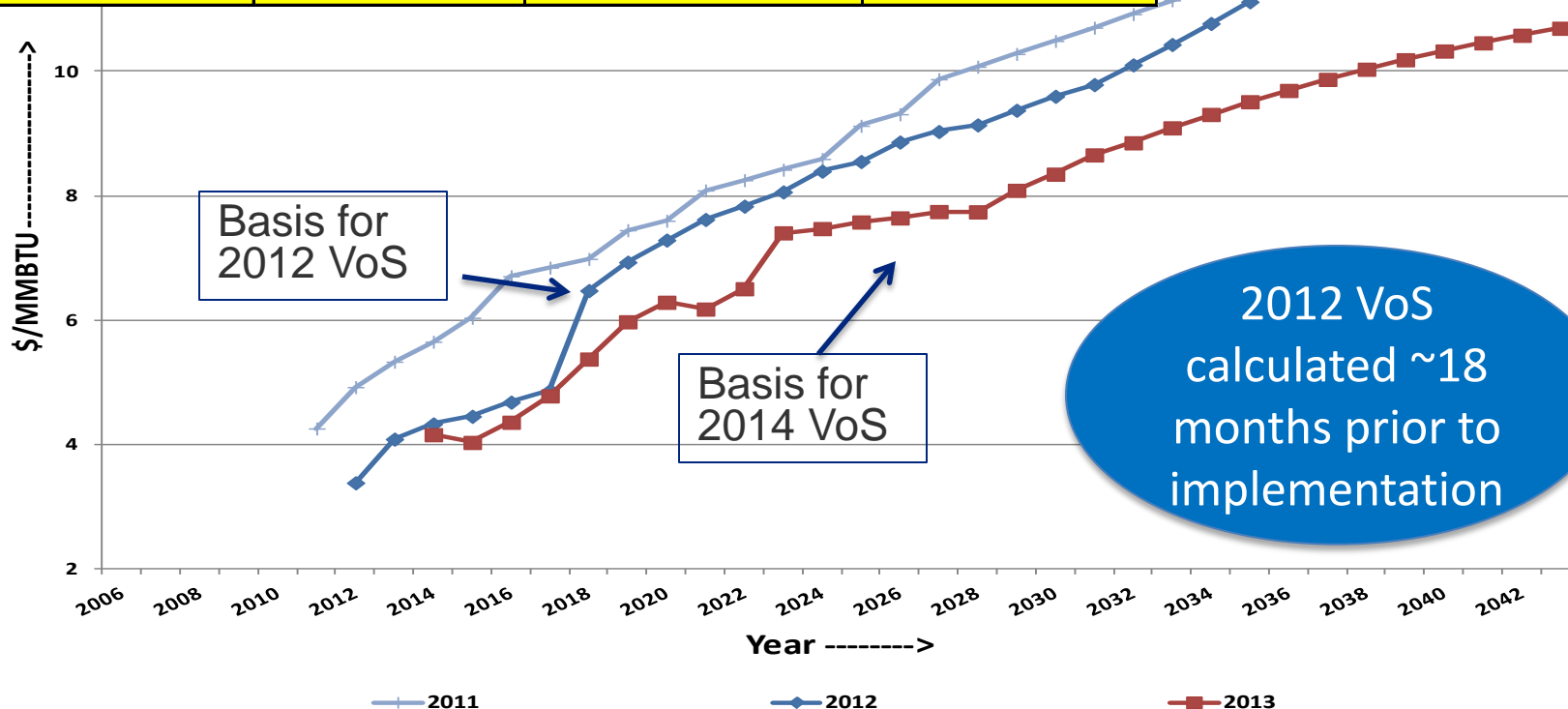
Economic Value (\$/kWh)	Load Match (No Losses) (%)	Distributed Loss Savings (%)	Distributed PV Value (\$/kWh)
\$0.053		4%	\$0.055
\$0.005		4%	\$0.005
\$0.026	62%	6%	\$0.017
\$0.015	62%	6%	\$0.010
\$0.000	39%	7%	\$0.000
\$0.020		0%	\$0.020
<u>\$0.119</u>			<u>\$0.107</u>



Natural Gas and the VoS

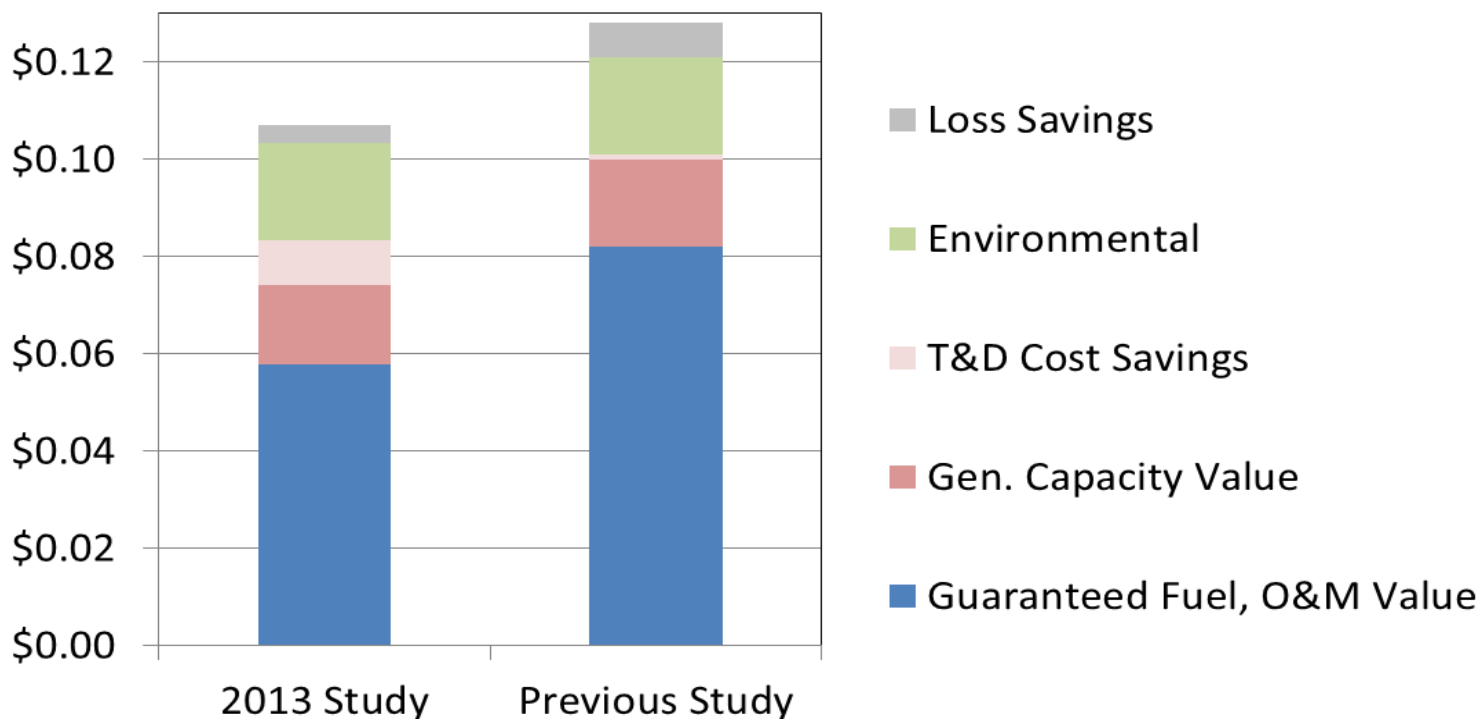
- The VoS and the future price of natural gas generally trend with one another
- Other components also influence the result

Year of Study	VOS Effective date	Long term Avg. Gas Price (\$/MMBTU)	VOS (Cents/kWh)
2011	2012	\$9.19	12.8
2012	2013	\$8.83	NA
2013	2014	\$7.90	10.7





How Do Results Compare to Previous Study?





16% Reduction in VoS

Why Have Results Changed?

- Natural gas prices have declined
- Assumed system life aligned to warranty period (25 vs. 30 years)
- Loss savings are slightly lower
- Transmission savings results have increased
- Methodology has been refined for ERCOT market



Appendix



How VoS Applied?

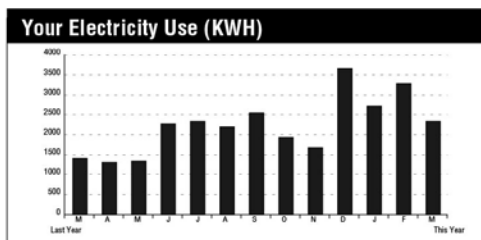
Residential Solar Tariff:

- Meter consumption and production separately
- Customer billed for whole house consumption
 - Energy delivered (by utility) to home, plus total energy produced by PV
- Customer credited for solar production
 - Credited for all solar generation, whether used onsite or sent back to grid
 - $\text{Solar credit} = \text{Total kWh produced} \times \text{VoS factor}$
 - Balance applied to electric bill until it zeroes, remaining credits roll over month-to-month



Understanding the Residential Solar Bill

Service Details



Days of service 30
kWh used 2332
Avg. kWh per day 77.7
Avg. cost per day \$8.93
 13 month avg. consumption: 2231.23



ELECTRIC SERVICE

PowerLink Number: 0000000000
 111 Anywhere Street

Meter

Read Date	02/15/2014	03/17/2014	Read Diff.
Delivered Read	38358	40849	2491
Received Read	471	631	160
Net Read	37886	40218	2332

Meter

Read Date	02/15/2014	03/17/2014	Generation
Solar PV Read	9372	9815	443
Total Generation in KWH			443

Whole House Consumption in kWh

2775

The solar customer is billed on Whole House Consumption which is applied to the five tier rate schedule. Whole House Consumption is calculated by adding the net energy consumed from the grid to the PV production.

The solar customer is then credited for their PV production at the Value of Solar Rate.

If the Total Current Charges result in a negative amount, a credit will roll forward to the next month's bill. Credits are non-transferrable and non-refundable and may only be applied to the electric bill they are associated with, or other electric accounts on the same premise, in the same customer's name.

COA - Electric Residential	
Customer Charge	\$10.00
Tier 1 first 500 kWh at \$0.018 per kWh (winter)	\$9.00
Tier 2 next 500 kWh at \$0.056 per kWh (winter)	\$28.00
Tier 3 next 500 kWh at \$0.0717 per kWh (winter)	\$35.85
Tier 4 next 1,000 kWh at \$0.0717 per kWh (winter)	\$71.70
Tier 5 remaining 275 kWh at \$0.0717 per kWh (winter)	\$19.72
Regulatory Charges 2,775 kWh at \$0.00794 per kWh	\$22.03
Temporary Regulatory Charge 2,775 kWh at \$0.00057 per kWh	\$1.58
Community Benefit Charges	\$14.37
Power Supply Adjustment 2,775 kWh at \$0.03709 per kWh	\$102.92
Solar Credit 443 PV kWh at \$-0.107 per kWh	-\$47.40
Residential Sales Tax	

TOTAL CURRENT CHARGES \$267.77

Want to save money on your electric bill? Visit austinenenergy.com for information on our rebate programs and energy saving tips.