

Texas Solar Market Update

Charlie Hemmeline 8/22/18



- The Texas Solar Power Association (TSPA) is a statewide industry trade association that promotes the development of solar electric generation in Texas
- Member companies are investing in Texas, cost-competitively serving customers in both wholesale and retail markets
- Our membership includes manufacturers, large-scale power plant developers, residential and commercial rooftop integrators, and other companies in Texas participating across the full solar photovoltaic supply chain
- TSPA aims to be a resource for information on the Texas solar industry





National Trends



- The total U.S. operating solar PV capacity is now over 50,000 MW-dc with the cumulative number of solar installations well over one million
- Solar power represented 30% of all new electric generating capacity brought online in the U.S. in 2017, ranking second over that period only to natural gas.
- 75% of the current utility-scale pipeline of projects due to customer-driven demand not state mandates
- Total installed U.S. PV capacity is expected to more than double over the next five years and by 2022, nearly 15 GW of PV capacity will be installed annually

Solar costs fell 86% from 2009-2017



The Case for Solar in Texas is Strong

Texas has:

- Growing energy demand
- Peak energy needs
- Sustained drought
- Air quality constraints
- Largest solar resource in US
- Largest energy market in US
- Public support in polling

Solar offers:

- High value electric supply
- Zero fuel costs
- Minimal to no water use
- Rapid deployment
- Economic development & jobs
- Environmental benefits
- Trillion dollar global industry
- Unprecedented affordability



Market-specific Benefits for Texans

Retail: Residential & Comm.

- Solar offers customers the choice to self-generate
- Provides an opportunity to reduce electricity bills, control future costs and earn attractive financial returns
- Provides generation where it's needed, reducing grid line losses and congestion

Wholesale: Power plants

- Cost-competitive peak power
- Rapidly deployable, delivering better cost certainty and alignment with load needs
- Minimal viewshed impact typically no taller than 10 feet off the ground

Abundant Supply



Texas has the largest total solar potential in the U.S. on account of our intense sunshine and very large land area

Texas Solar in Context: ERCOT Energy Use



Source: ERCOT Quick Facts, ERCOT Demand & Energy Report January 2018

Solar in Texas Today: State of the State

- 1,874 MW installed in Texas through 2017
- In 2017, Texas had the 4rd best year of any state and is now ranked 7th in cumulative capacity
- Texas is a unique and complex market
- We have started slower than states with intentional solar policy but are beginning to develop our enormous potential based on market drivers

	Rank				
State	Cumulative	2016	2017		
California	1	1	1		
North Carolina	2	4	2		
Florida	10	9	3		
Texas	7	6	4		
Massachusetts	6	8	5		
Minnesota	15	14	6		
Arizona	3	7	7		
South Carolina	18	20	8		
Nevada	4	5	9		
Virginia	17	17	10		
New Jersey	5	10	11		
New York	11	12	12		

Source: GTM Research/SEIA: U.S. Solar Market Insight®





Texas Market Activity: Retail

- Residential and commercial installations ~ 20% of TX capacity
- Managed programs
 - CPS Energy
 - Austin Energy
 - T&D utilities, e.g. Oncor
 - Various other municipal and co-op utilities
- Competitive markets
 - E.g. Houston, Dallas area
- Off-grid / special applications

Competitive Retail Market Innovation

- In the deregulated Texas market, Retail Electricity Providers are not required to buy excess solar generation from customers
- However, leading REPs are now competing for solar customers by voluntarily offering rate plans that credit customer solar generation

Company	Plan Name	Rate / kWh	Rate Type	Term
Reliant	Reliant Solar Sell Back Plan	\$0.117	Fixed	12 Months
ΤΧυ	Clean Energy Credit Program	\$0.075 \$0.106	Variable Fixed	Month-to-Month 24 Months
Green Mountain	Renewable Rewards [®] Renewable Rewards [®] 12 Renewable Rewards [®] 24	\$0.122 \$0.116 \$0.116	Variable Fixed Fixed	Month-to-Month 12 Months 24 Months
MP2 Energy	MP2 Solar Buyback Program MP2 Net Energy Metering Program	\$0.106-0.114 \$0.106-0.114 \$0.081-0.102 \$0.117-0.125 \$0.096-0.106	Fixed Fixed Variable Fixed Variable	12 Months 24 Months 24 Months 60 Months 60 Months

Sources: Power to Choose website, company materials/communications.

Competitive Retail Market Innovation

- In addition to offering credits for customer generation, REPs are getting more directly involved in providing solar options for customers:
 - Facilitating installations
 - Dedicated supply from TX-based solar plants
 - Community solar

"I want to be very clear that this was largely driven out of demand from our retail side," -- Curt Morgan, CEO of Vistra Energy

"This deal demonstrates that solar is truly becoming competitive in the most competitive electricity market in the U.S." -- Jeff Starcher, CEO of MP2 Energy







Texas Market Activity: Wholesale

- Initial utility-scale solar plants sited in central TX (2010-2014):
 - Centennial Solar (19.8 MW)
 - Blue Wing (14.9 MW)
 - Webberville (26.7 MW)
 - Alamo Solar 1 + 4 (39.2 + 38 MW)
- New build out of larger west TX plants underway (2014-present):
 - Upton Solar 2: Vistra (180 MW)
 - Roserock: Recurrent / Southern (157 MW)
 - East Pecos: First Solar / Southern (121 MW)
 - Midway Solar: 174 Power Global (236 MW)
 - Alamo Solar 6: OCI / Berkshire (108 MW)
 - CED Upton: ConEdison (158 MW)
 - Lamesa Solar: RES Americas / Southern (102 MW)
 - Lasso: Solairedirect (50 MW)





Courtesy of CPS Energy

Corporate demand is growing

- Nearly **half** of the companies in the 2016 Fortune 500 and **63%** of the Fortune 100 have set targets to increase renewable energy sourcing and/or reduce greenhouse gases (GHG)
- Nearly two dozen Fortune 500 companies have committed to power all of their corporate operations with 100% renewable energy

September 19, 2017 Citi to be 100 Percent Powered by Renewable Energy by 2020

"We are right alongside our clients in supporting the growth of renewable energy development and production" -- Citi CEO Michael Corbat.

Source: CERES Power Forward 3.0, Citigroup press release 9/19/17

Looking Ahead: Power Plant Development Pipeline

- As of July 2018, Texas has over 35,000 MW of solar projects in development
- ~ 2,500 MW with signed interconnection agreements
- 75+ counties have projects online or in development

Source: ERCOT, SPP, MISO, EPE

Note: map includes projects online and those with executed interconnection agreements or under full study



Looking Ahead: ERCOT Projections

Total Generation by Fuel Type in 2031



Source: ERCOT Long Term System Assessment 2016

- Solar becomes a meaningful contributor under all scenarios
- "Business as usual"
 Current Trends scenario is 20,200 MW or 12.5% of generation
- Plus 3,500 MW rooftop solar counted as load reduction

Policy

- "Do No Harm" no new fees, taxes, or barriers to entry.
- Legislative, PUC review of Summer 2018 ERCOT market performance
- Maintain existing economic development programs
- Overcoming barriers as needed





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