

Solar in Texas:

Current Status and Future Projections

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2/8/17



- 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





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Outline

- Texas market foundations
- Current status and new developments
- Looking ahead
- Legislative session preview

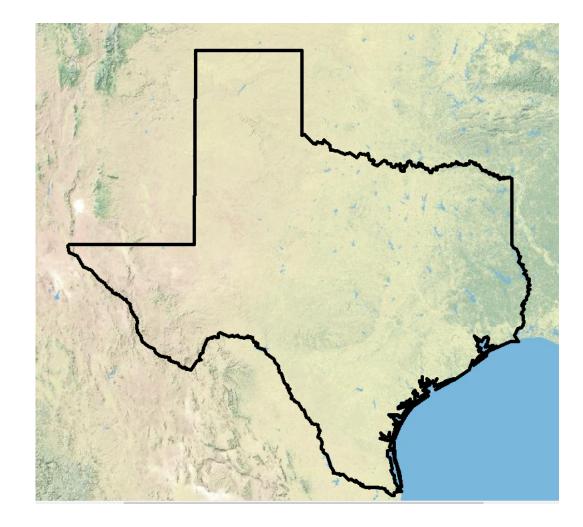


National Trends

- Through Q3 2016, the total U.S. operating solar capacity is over 33 GW-dc with the cumulative number of solar installations surpassing one million
- The U.S. installed 4,143 MW-dc of solar PV in Q3 2016, our largest quarter ever
- On average, a new megawatt of solar PV capacity came online every 32 minutes from July September
- 14.1 GW-dc total additions projected in 2016, 88% growth over 2015
- The U.S. solar industry employs over 260,000 workers as of November 2016, up 25% in past year

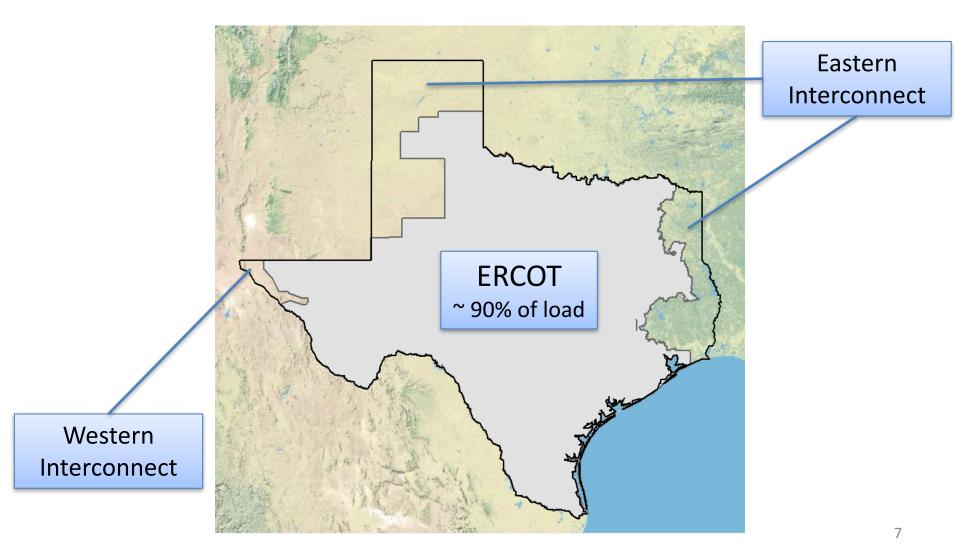


Texas Electricity Market Overview



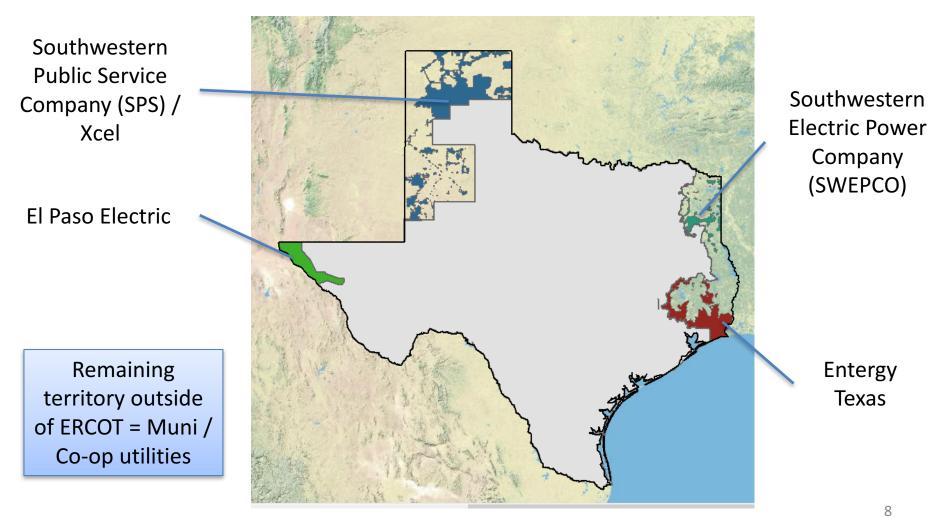


Texas Electricity Market Overview: Interconnects



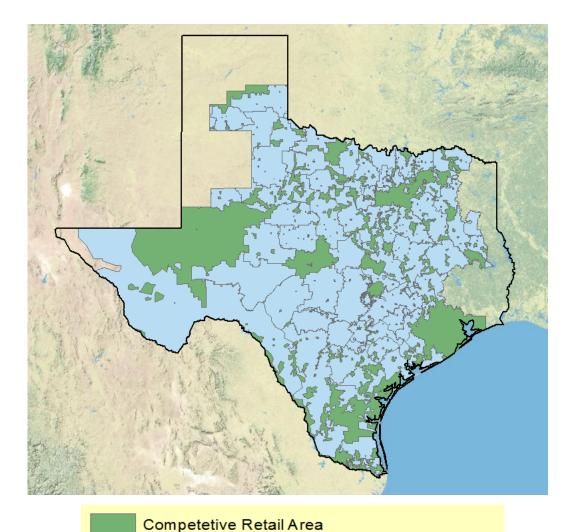


Texas Electricity Market Overview: Utilities outside of ERCOT





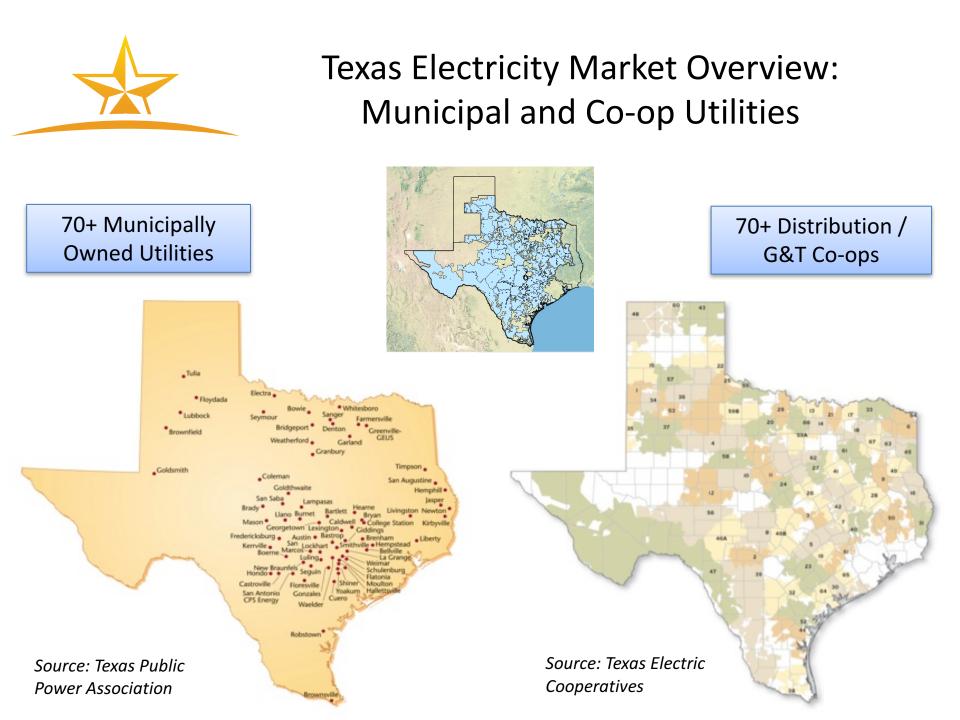
Texas Electricity Market Overview: Inside ERCOT



- 24 million consumers
- 78,000+ MW peak generation capacity
- Record peak demand = 71,110 MW on 8/11/16
- Competitive retail area = 75% of ERCOT load
- Municipally owned and Co-op utilities ("Non Opt-In Entities" or NOIEs) = 25% of ERCOT load

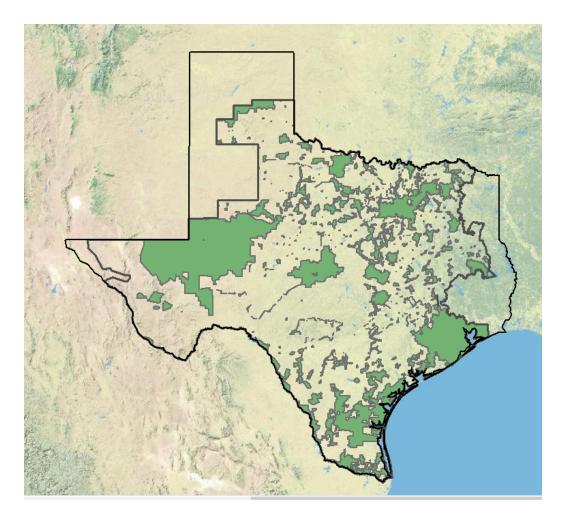
Source: ERCOT Quick Facts

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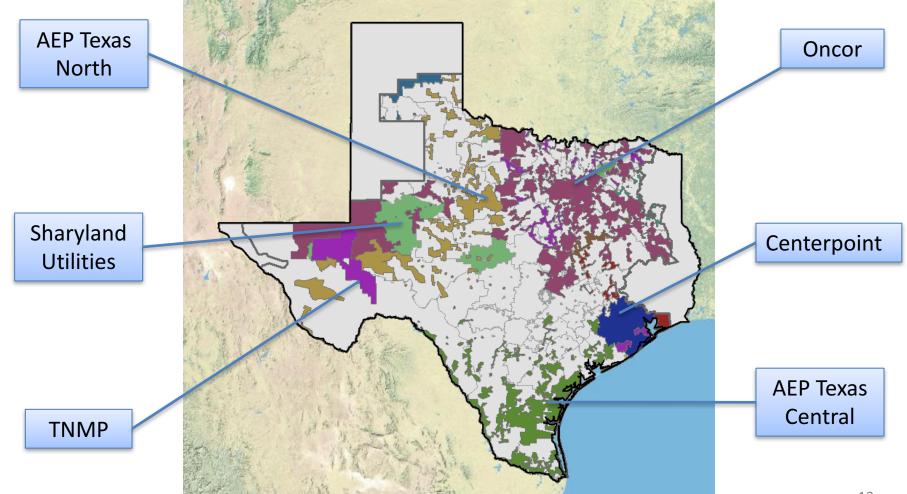
Texas Electricity Market Overview: Competitive Retail Area - Retail Providers



- 110 registered Retail Electric Providers active in the competitive choice area of ERCOT
- E.g. TXU, Reliant, Gexa, Direct Energy, MP2, Green Mountain

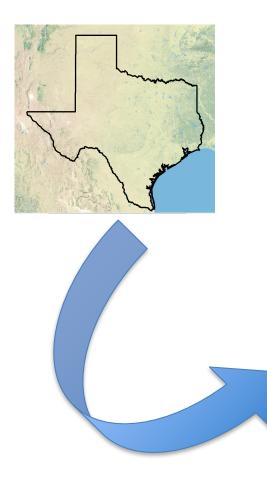


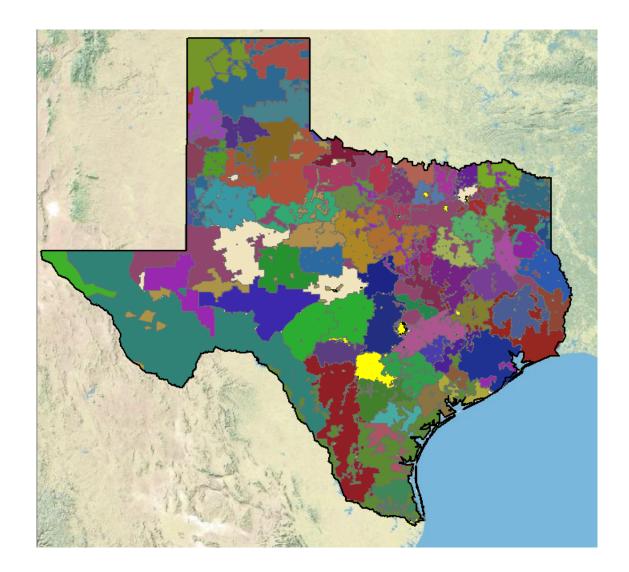
Texas Electricity Market Overview: Competitive Retail Area - Transmission & Distribution Service Providers





Texas Electricity Market Overview: A combined view







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

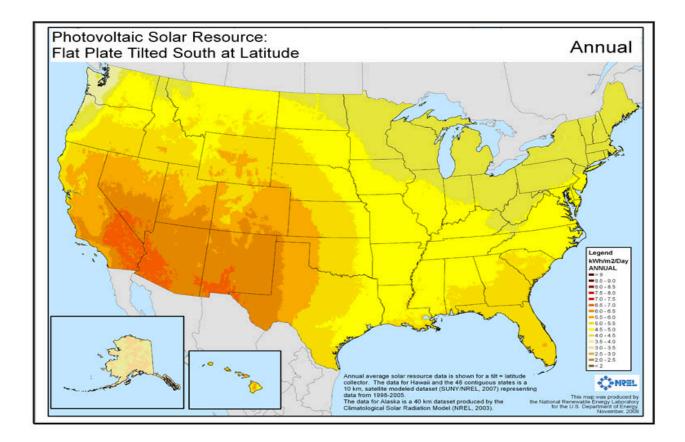
Solar offers:

- 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





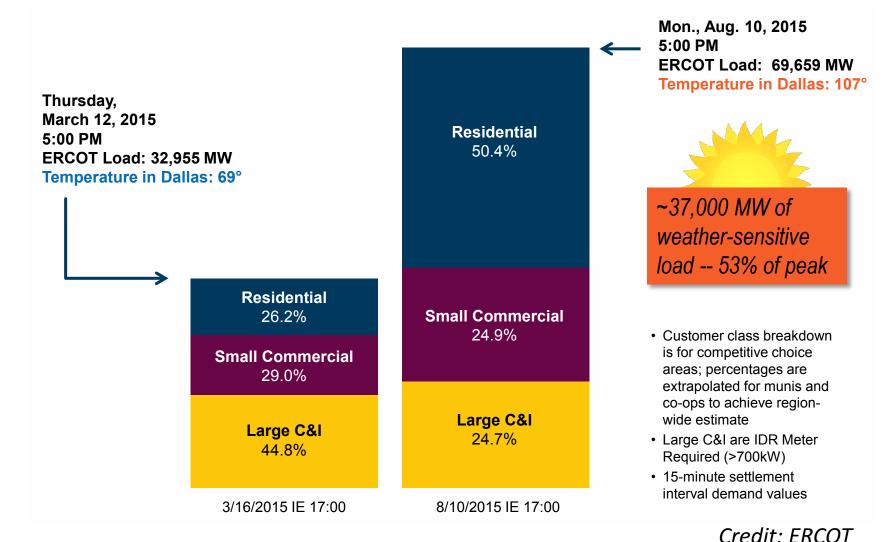
Abundant Supply



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



Residential A/C use drives peak needs and follows the sun







Solar in Texas Today: State of the State

- 965 MW installed through Q3
 2016
- Texas had the 3rd best quarter of any state and is now ranked 8th 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	2015	Q3 2016	
California	1	1	1	
Utah	7	8	2	
Texas	8	9	3	
Georgia	10	6	4	
Colorado	11	12	5	
North Carolina	2	2	6	
New Mexico	14	16	7	
Arizona	3	5	8	
Oregon	19	21	9	
New York	9	7	10	
Idaho	39	39	11	
Massachusetts	6	3	12	
New Jersey	4	10	13	

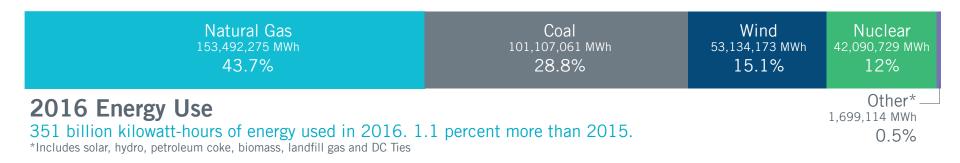
Source: GTM Research/SEMA.ⁱⁱU.S. Solar Market Insight^{® 13}

Connecticut	16	15	16

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Texas Solar in Context: ERCOT Energy Use



In 2016, compared to solar generation:

- Natural gas was 219x larger
- Coal was 144x larger
- Wind was 76x larger
- Nuclear was 60x larger

Goal #1 for solar: get out of the "other" wedge



Texas Solar Jobs

- The solar industry is making an economic impact with 9,396 jobs through 2016, up 34% in the past year
- Additionally, thousands of workers are spending up to half-time on solar: traditional industries such as construction and electrical product manufacturing are now adding new solar revenue streams to existing business lines

Source: The Solar Foundation: National Solar Jobs Census 2016

THE WALL STREET JOURNAL.

BUSINESS

As Oil Jobs Dry Up, Workers Turn to Solar Sector

Burgeoning solar projects offer opportunities for out-of-work rig hands, roustabouts and pipe fitters



By LYNN COOK

April 21, 2016 7:16 p.m. ET

Workers install massive racks that will hold solar panels at the Alamo 6 solar farm under construction in McCamey, Texas, about 300 miles northwest of San Antonio. PHOTO: JENNIFER BOOMER FOR THE WALL STREET JOURNAL



Texas Market Activity: Retail





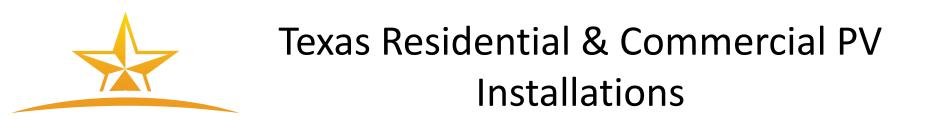
- Capacity through Q3 2016:
 - 128 MW Residential
 - 81 MW Non-Residential C&I
- Managed programs
 - CPS Energy
 - Austin Energy
 - T&D utilities, e.g. Oncor
 - Various other municipal and co-op utilities
- Competitive markets
- Off-grid / special applications

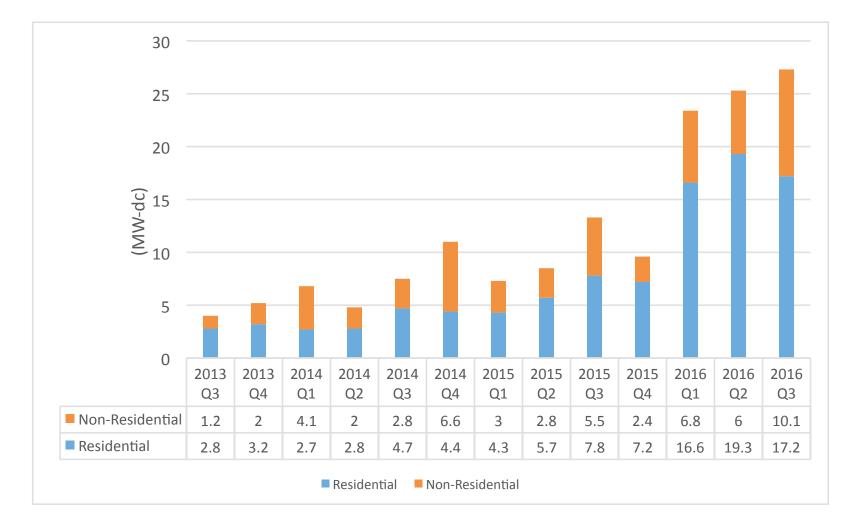


Competitive Retail Market Innovation

- 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	\$0.113	Variable	Month-to-Month
TXU	Clean Energy Credit Program	\$0.075	Variable	Month-to-Month
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





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



Texas Market Activity: Wholesale

- 756 MW of power plants online through Q3 2016, including:
 - Recurrent Energy / Southern Power (157 MW)
 - Alamo Solar 7 (105 MW)
 - Alamo Solar 1 + 4 + 5 (39.2 + 38 MW + 95 MW)
 - Barilla Solar I (30 MW)
- More than 800 MW under contract / construction, including:
 - First Solar / Southern Power (120 MW)
 - OCI Solar Power (110 MW)
 - Hanwha Q Cells (170 MW)
 - ConEdison Development (150 MW)
 - RES Americas (200 MW)





Courtesy of CPS Energy

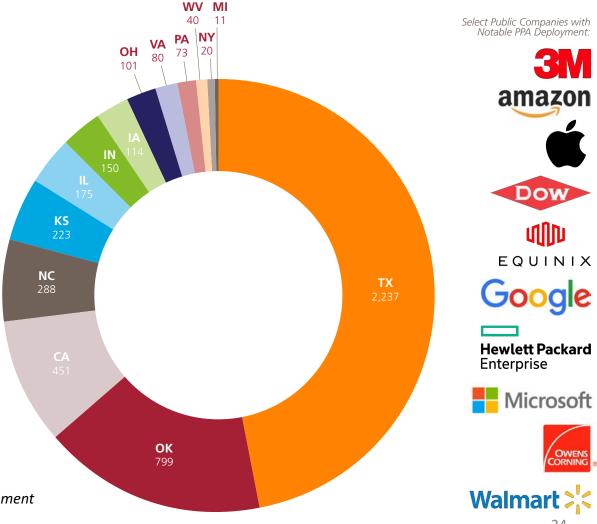
Total = over 1,500 MW



Texas is leading on corporate offsite wind & solar

- Corporates getting involved in direct deals for offsite wind & solar projects – TX leads the nation
- Provides additionality and scale
- All wind in Texas to date but poised to become a big area of growth for solar

Source: AWEA and RMI Image: Corporate Clean Energy Procurement Index – RILA, ITI, Clean Edge



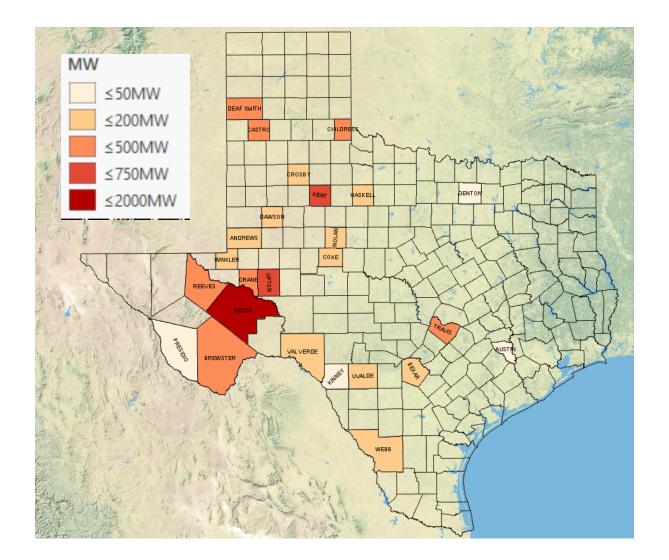


Looking Ahead: Power Plant Development Pipeline

- Through January 2017, there are 14,498 MW of solar projects in development in ERCOT
- 2,019 MW with signed interconnection agreements
- 25 counties have projects online or in development

Source: ERCOT

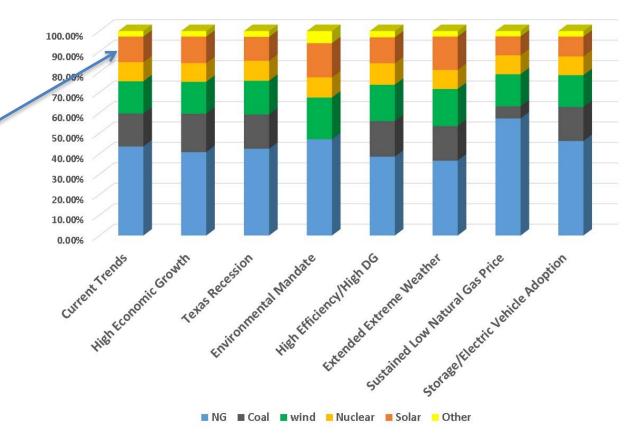
Note: map includes projects online and those with executed interconnection agreements or under full study





Looking Ahead: ERCOT Projections

Total Generation by Fuel Type in 2031



- 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

Source: ERCOT Long Term System Assessment 2016



Legislative Priorities

- "Do no harm" no new fees, taxes, or barriers to entry
- Continued education on the solar industry
- Maintain existing economic development programs
- Support continued growth in solar investment





Initial bills of interest

- HB 445 (Frank), SB 277 (Campbell), HB 1105 (Miller) - Relating to the eligibility of certain property for certain ad valorem tax incentives relating to wind-powered energy devices; development around military facilities.
- SB 83 (Hall), HB 407 (Tinderholt), HB 787/788 (Parker) – relating to protection of energy critical infrastructure from electromagnetic, geomagnetic, terrorist, and cyber-attack threats.
- HB 386 (Murphy), HB 559 (Hernandez), SB 400 (Kolkhorst), SB 600 (Burton) – relating to the Texas Economic Development Act





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