

# The Texas Electric Market: It's Still Broken

Is there a disincentive for gas producers to produce during a crisis?

Presented to:  
**Hart Energy's**  
**DUG Permian and Eagle Ford Conference & Exhibition**

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“This is the largest trainwreck in the history of deregulated electricity.”

- Rep. Senator Brandon Creighton



## Renewable Energy Mandates & the EPA A “Train Wreck” in the Making?



Presentation to:  
14<sup>th</sup> Annual Wyoming Natural Gas Fair, September 16, 2010  
By: John Harpole, Mercator Energy

## Where is the RES Train Headed?



 Mercator Energy

## “29 Governors ask Obama and Congress for stronger wind power measures”

Tiffany Hsu, *The Los Angeles Times*, March 16, 2010



Photo: Robert Gauthier, Los Angeles Times

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## Colorado - Tilting to the Left



 Mercator Energy



## Colorado as a Laboratory

The Renewable Energy Standard Promise:



2004 Campaign Yard Sign

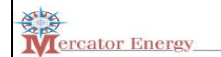
## The IPAMS/Bentek Study A Catalyst to Avoid a Train Wreck?



## Hang on Colorado...30% Renewables by 2020?



## The RES Train Has Left the Station But is it in the right direction?

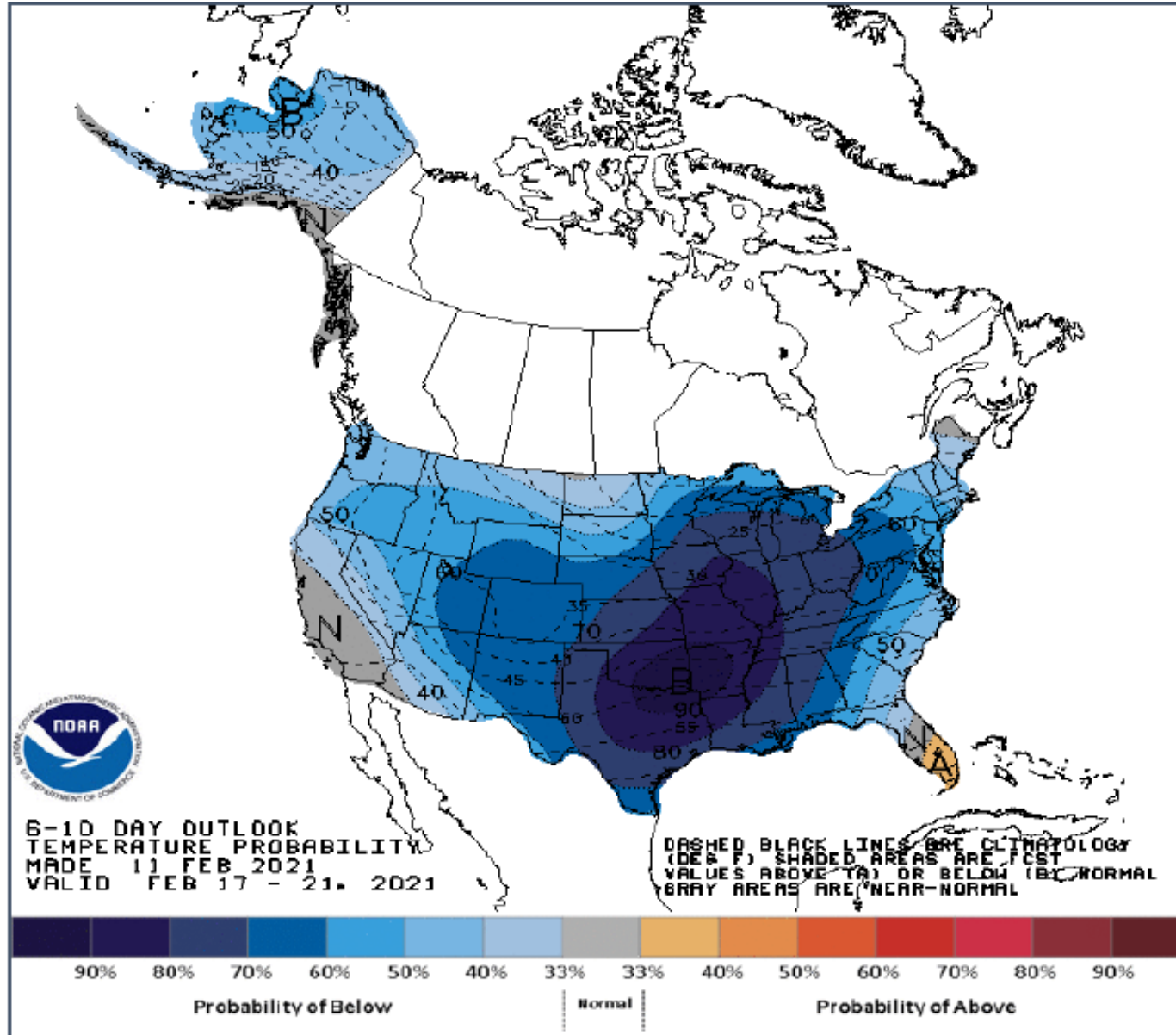


Natural gas: not just a bridge to renewables.  
It's a way to avoid a train wreck.





# 6 – 10 Day Outlook on February 12, 2021

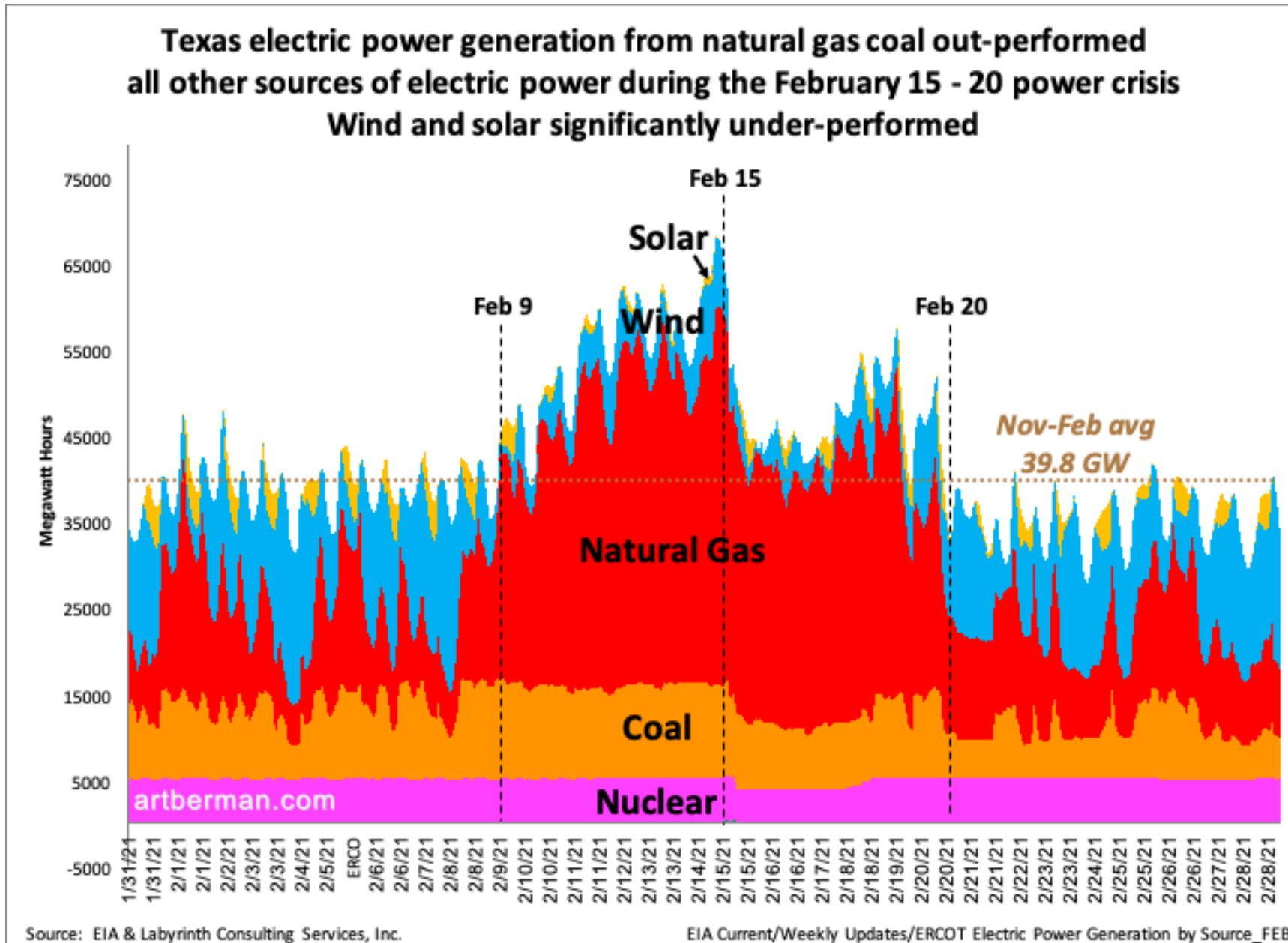


Source: CIMA Daily Weather and Market Report, Friday, February 12, 2021

- **15 consecutive days** with below average temperatures
- At least **3,000 cold temp records** broken from February 12-17, 2021
- **First ever wind chill warning** issued by NWS offices in Lake Charles, Houston & Dallas

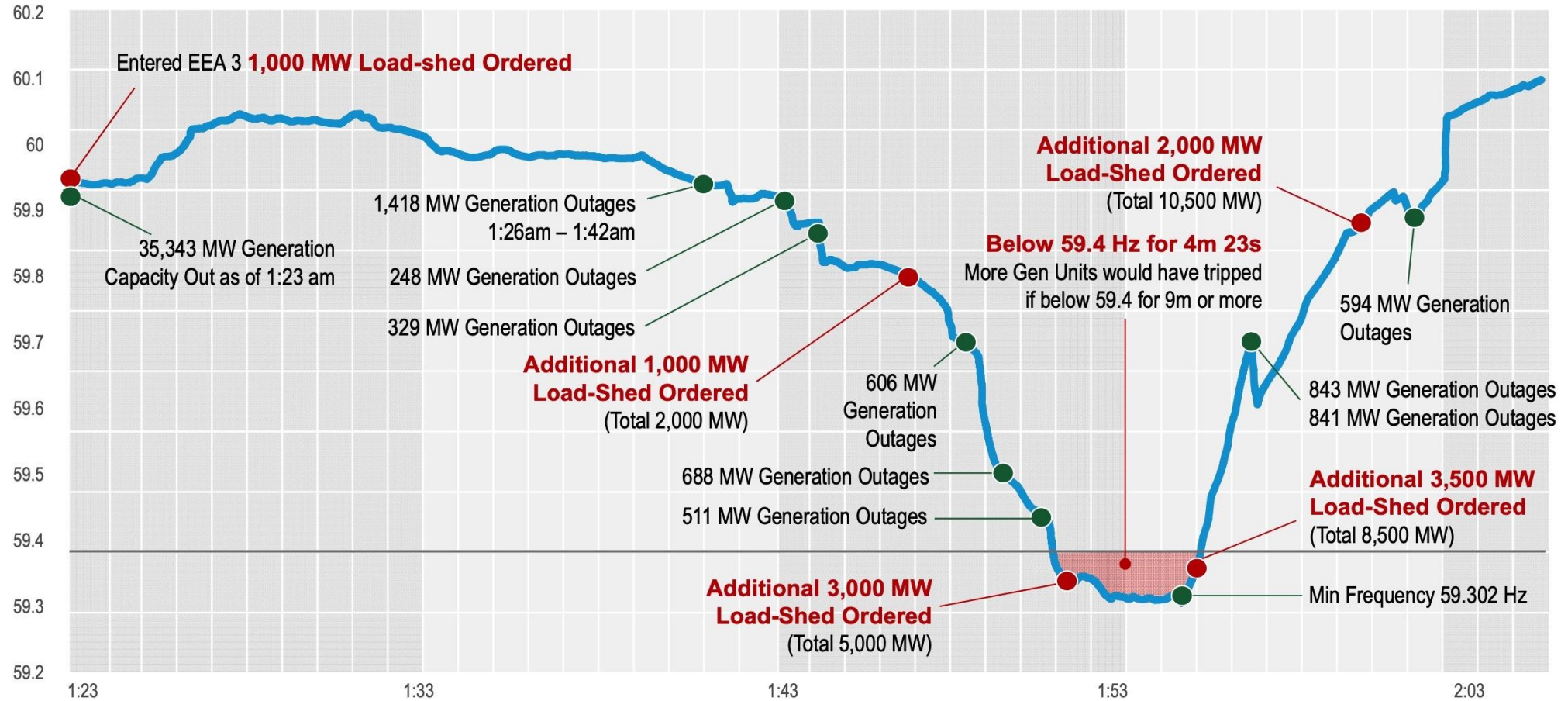


# The Perfect Storm: February 12 – 18, 2021





# Rapid Decrease in Generation Causes Frequency Drop



Monday, February 8<sup>th</sup> through Tuesday February 16<sup>th</sup>:

Wind  93%

Coal  47%

Natural Gas  450%

**“All performed as expected...”**

- The following segments of the natural gas chain rely on electricity to operate:
  - Wellhead, electric compression, gathering pipeline/field electric compression, and gas storage compression (EPA air permit avoidance... producers chose “pole power” over natural gas compression to avoid EPA air issues)
  - Natural gas processing plant facilities rely on electricity to run control systems, for inlet, residue and refrigeration
  - Inter and Intrastate pipelines that run electric power compression



- LACT (Lease Automatic Custody Transfer) units on oil wells that have associated gas production (what component of total Texas production is associated gas?)
- Many of these critical natural gas infrastructure assets were impacted by rolling blackouts
- Issues related to electricity supply for natural gas infrastructure were identified in 2011 and no priority was given to those critical assets

# FEBRUARY 2021

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13 No Trading
14	15 No Trading	16	17	18	19	20
21	22	23	24	25	26	27
28						

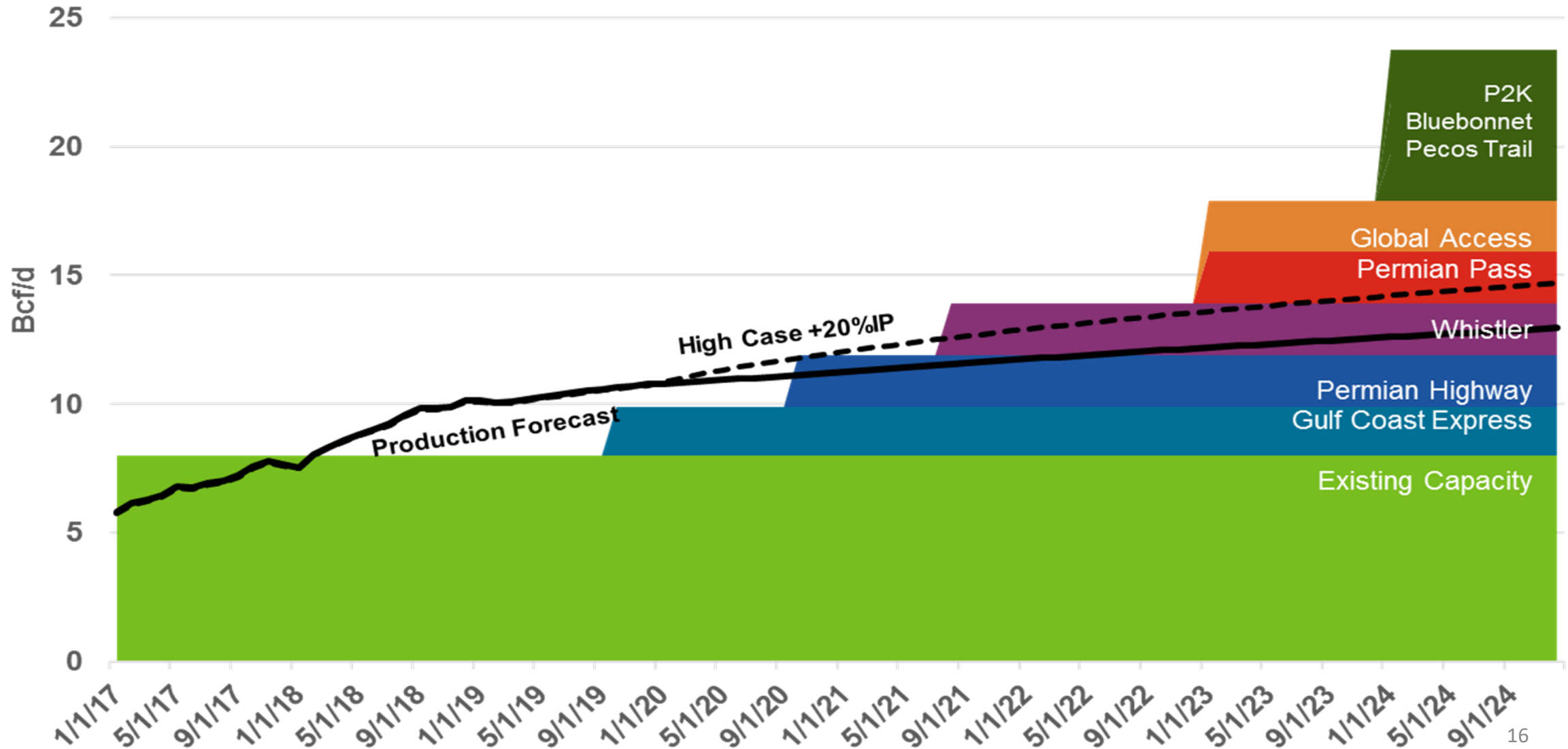
- The economics of the Permian Basin are driven by the oil price for oil production – not the price for the associated gas production.
- Most Permian producers dedicated their associated gas to midstream gathering companies to ensure that the gas moved so that the oil could be produced.



- The majority of midstream gathering contracts pay the producer on an 80/20 basis. That is, 80% of the gas price they receive for the month is based on an index established at the first of the month. 20% of the gas price they receive is priced out each day.
- Most midstream contracts call for a straight pass through of electric cost to the producer.

# 12+ BCF per day of Permian Associated Gas Production

## Permian Gas Production vs. Takeaway



- The PUC met Monday, February 15 to address the electric “pricing issue” and decided to order ERCOT to **set prices administratively at the \$9,000/MWh systemwide** offer cap during the emergency.
- \$9 / KWH for electricity = \$2,640.00 / MMBTU for natural gas
- Stated another way, any price a gas-fired generator paid below \$2,640.00 for natural gas supply was a good deal to convert a gas molecule to an electron
- After the crisis, the “watch-dog” for ERCOT determined that the system-wide \$9,000 per MW price was left in place too long, which cost the Texas wholesale electricity market +\$16 billion



- Natural gas index: WAHA Hub First of Month: \$2.49 per MMBtu
- Approximate cost of electricity: First of the Month: \$25 per MW (equates to approx. \$0.14-\$0.16 per MMBtu electric cost embedded in natural gas gathering charges)
- Gas Daily index: February 13-16 (Saturday – Tuesday), 2021: \$153.615 per MMBtu
- Price set by Texas Public Utility Commission for ERCOT: \$9,000 per MW (equates to approx. \$50.40 per MMBtu electric cost for gathering)

- If not for the 4-day President's Day weekend, natural gas costs to consumers would have been much higher.
- Remember, the daily spot price for natural gas for four days were negotiated and established on Friday, February 12<sup>th</sup> and fixed for Saturday, February 13<sup>th</sup>, Sunday, February 14<sup>th</sup>, Monday, February 15<sup>th</sup> and Tuesday, February 16<sup>th</sup>

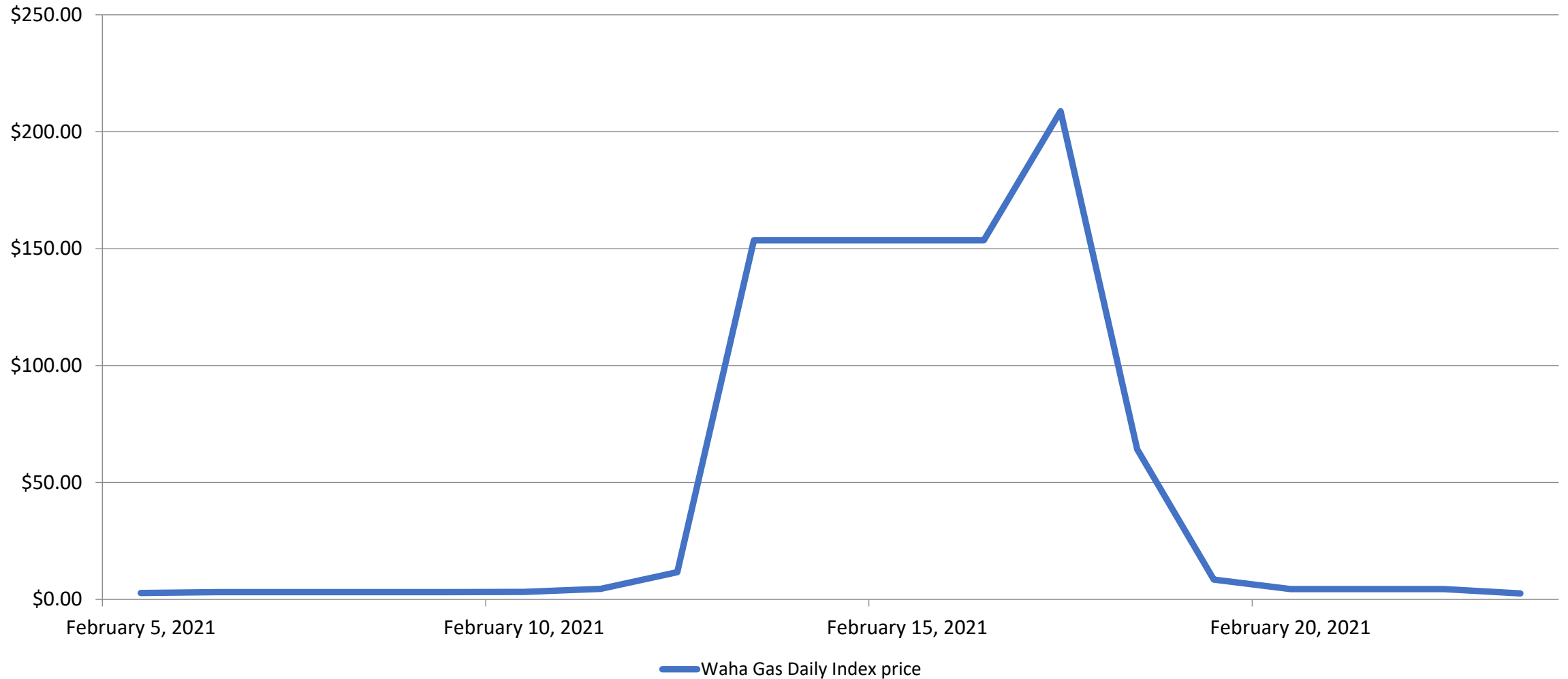
- A \$9,000 per MW price for electricity equals a price of \$2,640.00 per MMBtu of natural gas
- If not for the 4-day weekend, WAHA daily natural gas prices that were \$153.615 for four days could have soared well above \$2,000 per MMBtu

## Waha S&P Global Platts Gas Daily Index

Date	Gas Daily Index Price	Volume*	Deals
February 5, 2021	\$2.76	967	148
February 6, 2021	\$3.15	1237	187
February 7, 2021	\$3.15	1237	187
February 8, 2021	\$3.15	1237	187
February 9, 2021	\$3.14	841	127
February 10, 2021	\$3.26	1520	212
February 11, 2021	\$4.54	1297	201
February 12, 2021	\$11.69	1204	183
<b>February 13, 2021</b>	<b>\$153.62</b>	<b>770</b>	<b>133</b>
<b>February 14, 2021</b>	<b>\$153.62</b>	<b>770</b>	<b>133</b>
<b>February 15, 2021</b>	<b>\$153.62</b>	<b>770</b>	<b>133</b>
<b>February 16, 2021</b>	<b>\$153.62</b>	<b>770</b>	<b>133</b>
<b>February 17, 2021</b>	<b>\$208.79</b>	<b>452</b>	<b>78</b>
February 18, 2021	\$64.22	389	76
February 19, 2021	\$8.51	365	46
February 20, 2021	\$4.46	507	83
February 21, 2021	\$4.46	507	83
February 22, 2021	\$4.46	507	83
February 23, 2021	\$2.58	838	110

\*Volume in 000 MMBtu/day

## Waha S&P Global Platts Gas Daily Index



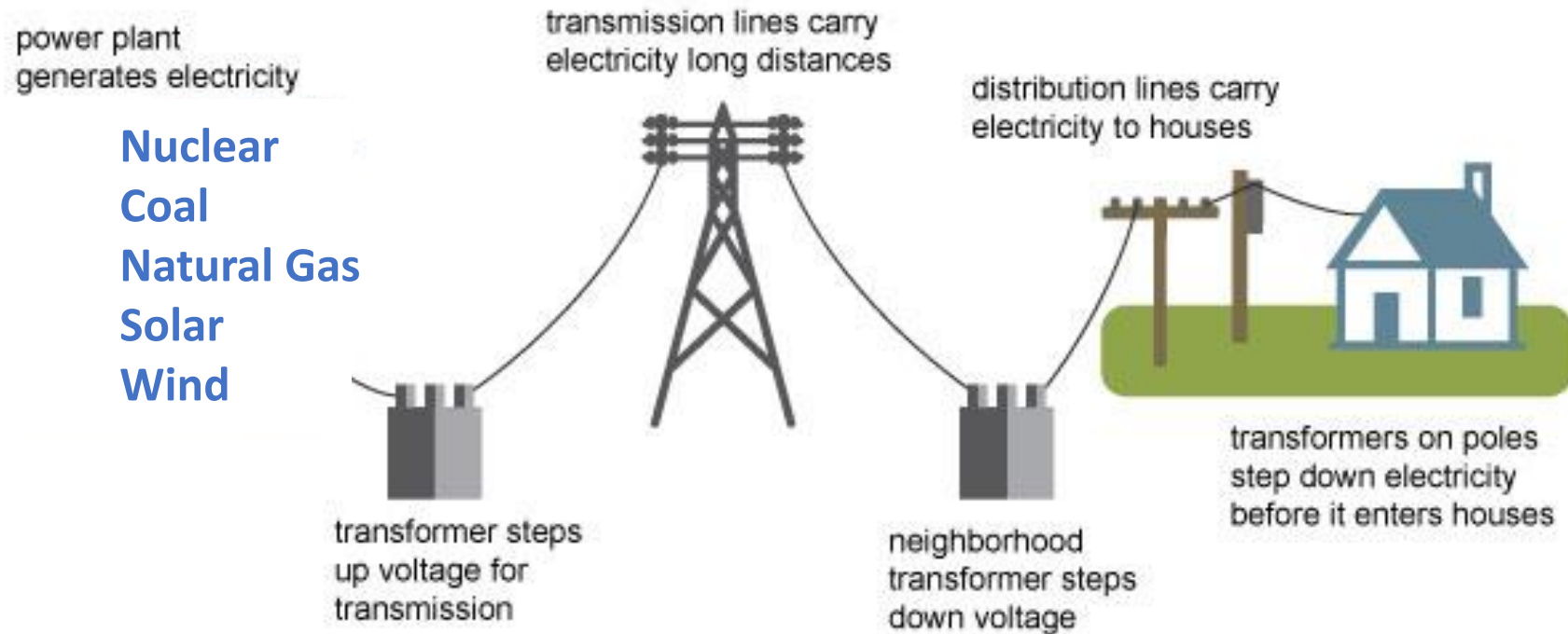


“The nature of electricity markets, instantaneous matching of supply and demand, means that intermittent technologies are not perfect substitutes for any one of dispatchable technology.”

*Source: Government Support for Intermittent Renewable Generation Technologies, Arthur Campbell, April 6, 2009, MIT Department of Economics*

- Electricity cannot be stored on a utility scale
- Demand must be met perfectly by supply – **it must balance constantly**

## Electricity generation, transmission, and distribution



Source: Adapted from National Energy Education Development Project (public domain)

Source: <https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php>

The five states with the most wind capacity installed at the end of 2019 were:



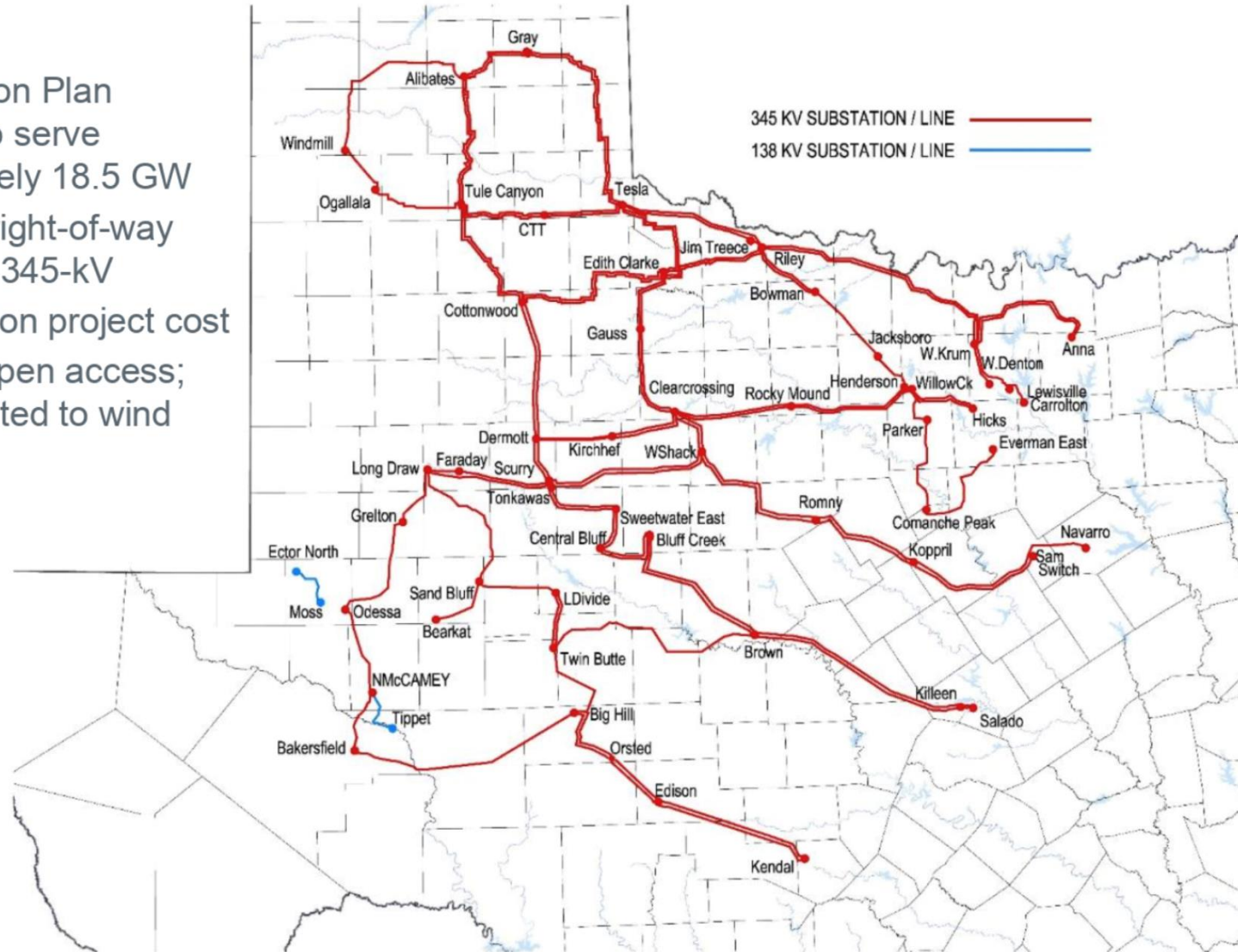
- 1. Texas (28,843 MW)**
- 2. Iowa (10,201 MW)**
- 3. Oklahoma ( 8,172 MW)**
- 4. Kansas ( 6,128 MW)**
- 5. California ( 5,973 MW)**

Andrew Barlow, Head of the PUC in Texas is quoted as follows,

“Legislators have shown strong support for the energy-only market that has fueled the diversification of the state’s electricity generation fleet and yielded significant benefits for customers while making Texas the national leader in installed wind generation.”

# CREZ Transmission Map

- Transmission Plan designed to serve approximately 18.5 GW
  - ~3,600 right-of-way miles of 345-kV
  - \$6.8 billion project cost
- Lines are open access; use not limited to wind





Renewable Subsidy Costs in Texas 2006-2029	
Subsidy/Credit	Amount
Production Tax Credit	\$16.3 billion
Investment Tax Credit	?
CREZ Transmission Lines	\$14.0 billion
Federal Stimulus Funds	\$1.6 billion
Renewable Energy Credits	\$570 million
Interconnection Costs	\$1 billion
313 Property Tax Limitations	\$2.5 billion
312 Property Tax Abatements	?
ORDC Costs Caused by Renewables	<i>\$2.5 billion?</i>
<b>Total</b>	<b>\$36.0 billion +</b>
<b>Average Annual Cost</b>	<b>\$1.50 billion +</b>
<b>Current Annual Cost</b>	<b>\$2.47 billion +</b>
<b>% of ERCOT 2018 Total \$ Sales</b>	<b>7.8% +</b>
<b>% of ERCOT Renewable \$ Income</b>	<b>28.8% +</b>

# Other Wind Subsidies in Texas

Eligibility for the PTC			
Parent Company	2016	2007-2016	# of Turbines
NextEra Energy, Inc.*	\$778	\$5,702	9,287
Iberdrola/Avangrid Renewables (Spain)*	\$301	\$2,651	3,497
EDP-Energias de Portugal*	\$217	\$1,671	2,487
Invenergy, LLC*	\$227	\$1,290	2,181
NRG Energy, Inc.	\$178	\$1,143	1,553
E.ON (Germany)*	\$171	\$1,134	1,987
Duke Energy*	\$158	\$938	1,636
BP plc (England)	\$148	\$913	1,179
Brookfield Asset Management Inc. (Canada)	\$189	\$770	1,525
Dominion Energy, Inc.	\$107	\$727	762
EDF-Electricite de France*	\$174	\$622	1,783
Exelon Corp.	\$95	\$528	839
Pattern Energy*	\$131	\$500	870
Enel (Italy)*	\$144	\$462	1,320
AES Corporation	\$36	\$330	1,191
<b>Subtotal</b>	<b>\$3,054</b>	<b>\$19,380</b>	<b>32,097</b>
Share of PTC Market	71%	76%	59%
<b>TOTAL</b>	<b>\$4,298</b>	<b>\$25,474</b>	<b>54,528</b>

## Negative Power Prices are OK for Wind

- Wind is bid at the lowest prices
- Wind operators have another advantage over generators that use coal or natural gas: a **federal production tax credit of 2.3 cents per kilowatt-hour** that applies to every kilowatt of power produced
- Even if wind operators give the power away or offer the system money to take it, they still **receive a tax credit equal to \$23 per megawatt-hour**

## “I Want My PTC”



As noted by the head of the PUC in Texas, an energy only market can fuel diversification towards intermittent resources. It does this because it rewards only energy that is fed into the grid, not backup power.

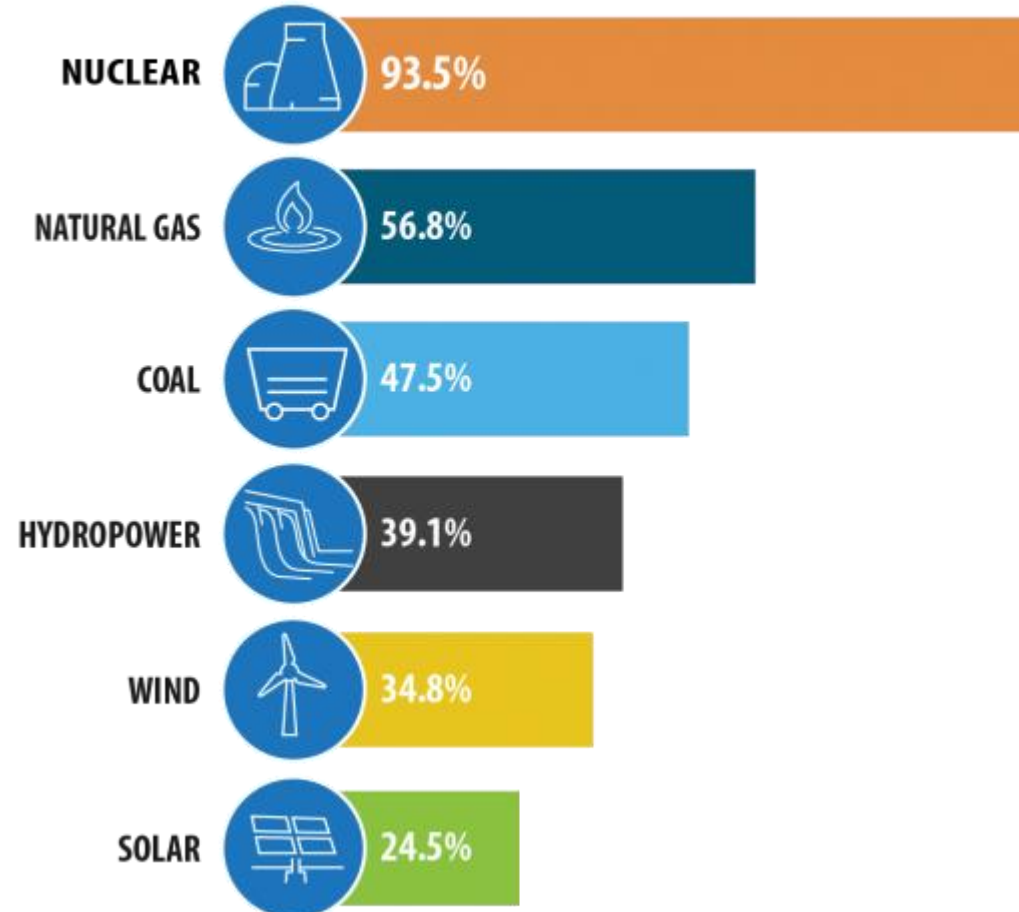
- ERCOT is the only grid operator that **does not operate a capacity market** that rewards reliability during peak usage days
- ERCOT relies solely on an “energy-only market” where **generators compete on the price of the energy they produce**
- For power producers in an “energy-only market”, there is **no penalty for failure to deliver** during a peak day emergency



- This market structure resulted in the **largest forced power outage in US history between February 12 – 18, 2021**
- Why would politicians choose this type of purpose-driven “energy-only” market that places **no extra value on dispatchable generation during peak hours?**
- I believe it was one of many incentives granted to **wind energy**



## Capacity Factor by Energy Source – 2019



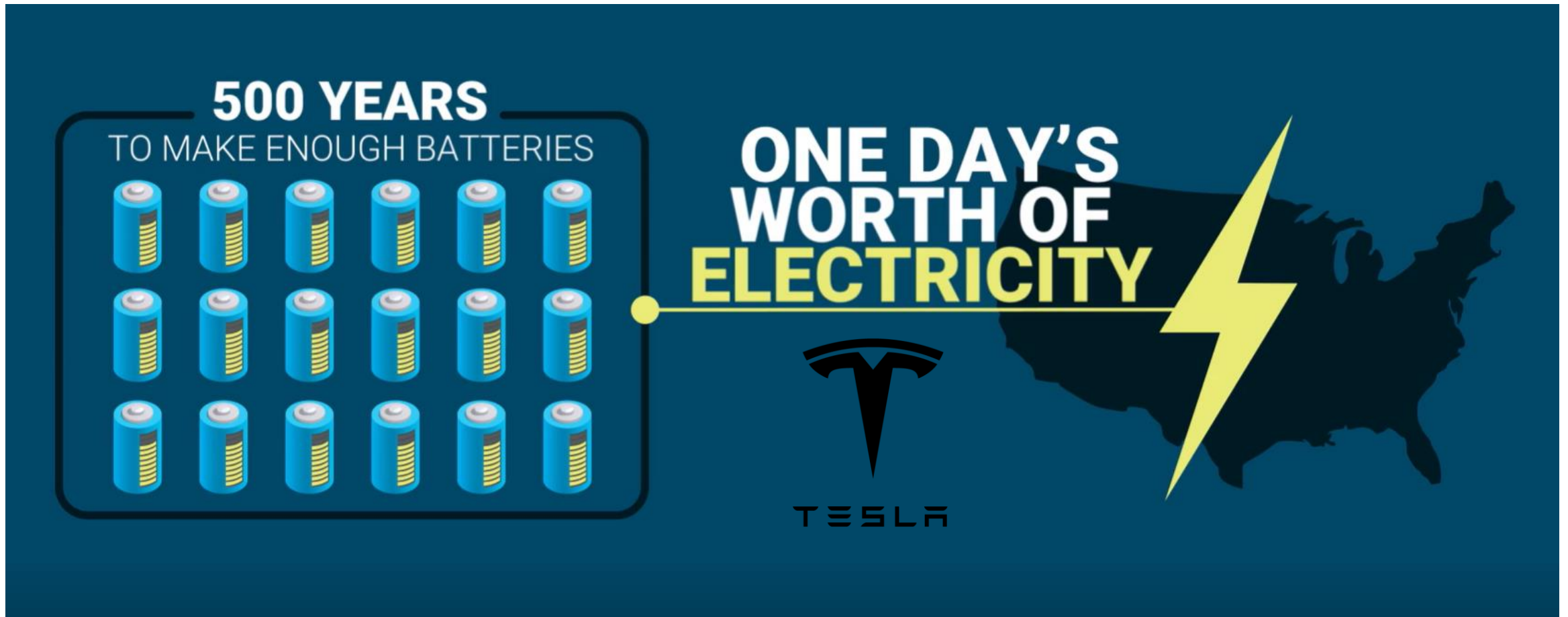
# Storage Cost Comparison: Natural Gas vs. Wind



Source: "What's Wrong with Wind and Solar?", PragerU, Mark Mills, September 14, 2020

# Limited Battery Production and Capacity

- **It would take 500 years** for Tesla's new factory in Nevada, the largest battery factory in the world, to make enough batteries to store **one day's worth of electricity needs for the US**



Source: "What's Wrong with Wind and Solar?", PragerU, Mark Mills, September 14, 2020

- Three quotes from Pat Wood 67 days after the Texas Rolling Blackouts.
- Pat Wood was Gov. George Bush's appointee and Chairman of Public Utility Commission of Texas (PUCT) in 1995. He was also the Chairman of the Federal Energy Regulatory Commission (FERC) under President George Bush from 2001-2005.





“The variability of the renewable resources is just something we are going to have to get good at...”



“...The CREZ project was just a game-changer nationally. In fact people are still calling me from foreign countries asking me about the CREZ... **just do the grid-wide planning and get the shit built.** It’s not really hard, it’s not a 10-day seminar that you need to run on building transmission. It just takes moxie and vision to do it and the legislature did in response to bipartisan need out in West Texas to if you build it, they will come. That was a very big welcome mat splayed out in Texas for the past 2 decades.”



“We’ve got to have all of the above... I have to say, sitting here in the dark after three days it really made me want to do whatever we could to make sure that’s still in the ground is still here. Maybe not used near as much for carbon purposes as we want it but I sure want it here and generating power on those days when the wind’s not blowing and on the nights when there is no solar and the batteries have been expended...”



# What did Socialists use for light before candles?





# Electricity



Has the electric transmission grid in Texas been socialized by an “all-of-the-above” energy supply mentality?



Is the argument for a capacity factor market the same argument made for meritocracy?

- Create a legislative fix for the producer's disincentive to produce during a crisis by allowing a “look-back” tariff/charge adjustment for critical infrastructure supplies of natural gas

- Every other electric transmission system operator in the U.S. relies on a capacity factor model. Perhaps Texas should consider “merit” over “all-of-the-above.”

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# Appendix



- The Weather Channel
- <https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php>
- *The Texas Freeze: Why the Power Grid Failed*, The Wall Street Journal, Katherine Blunt and Russell Gold, February 19, 2021
- *Assigning Blame for the Blackouts in Texas*, Climate Etc., Planning Engineer, February 18, 2021
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- <https://www.eia.gov/todayinenergy/detail.php?id=42915>
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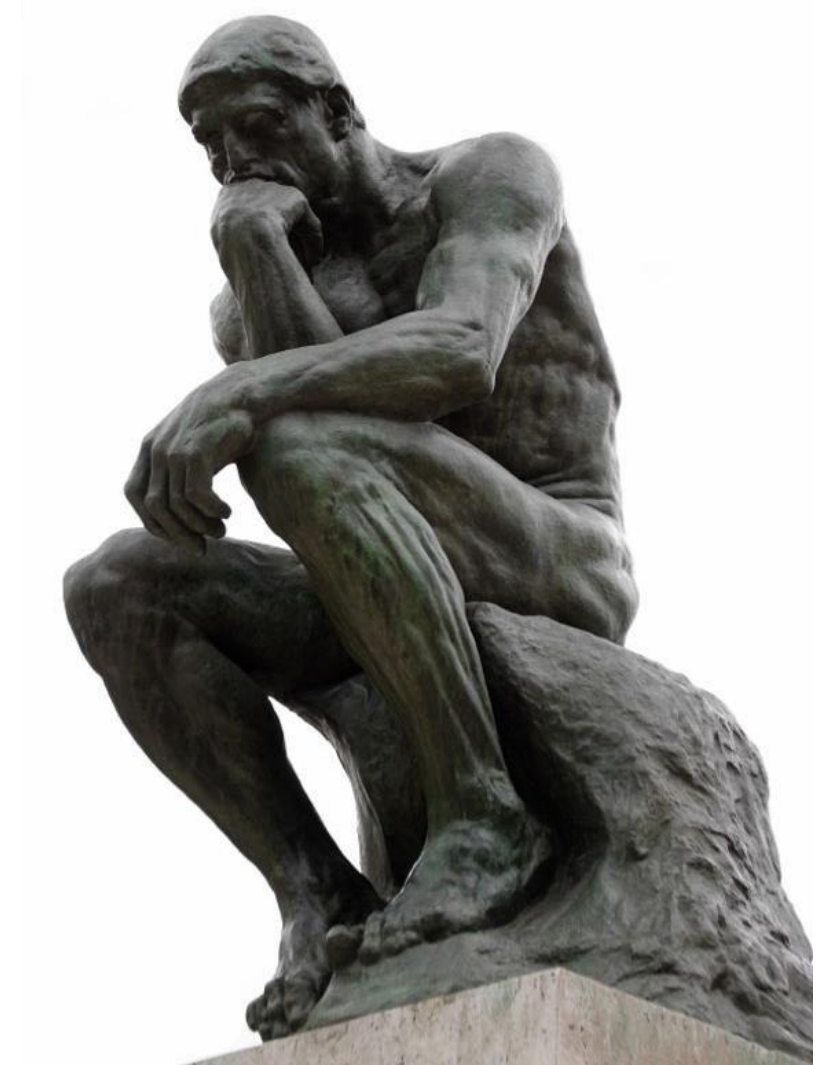
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- ERCOT Reliability: Systematic Unpreparedness, A Twentieth Century Solution for a Twenty-First Century Problem, Larry Kellerman and Robert McCullough
- Assigning Blame for the Blackouts in Texas, February 18, 2021, By Planning Engineer
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- *New Study Reaches a Startling Conclusion About the Cost of Solar and Wind Energy, Think Progress, Joe Romm, November 20, 2017*
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- *Searing Heat Is Hurting Texas Wind Power, Bloomberg, Brian K. Sullivan and Ryan Collins, July 5, 2017*
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- *Local Tax Abatements and the Texas Wind Industry: How Chapters 312 & 313 Are Scarring Rural Texas, Texas Public Policy Foundation, Stanley Greer, 2019*
- *The Texas Wind Power Story: Part I, Texas Public Policy Foundation, Lisa Linowes, 2018*
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- *The True Cost of Wind Energy, Texas Public Policy Fund, Bill Peacock, 2008*

- The **capacity factor (CF)** of an electric power plant is the **ratio of its actual output** over a period of time **to its potential output** if the plant could operate 100 percent of the time
- The CF for a power plant is calculated by **dividing** the **actual amount of electricity generated** by the plant by how much electricity the plant could have generated the same amount of time at 100% capacity

- Nuclear plants have **18+ months of fuel onsite** (higher reliability)
- Coal plants can have **6+ months of fuel onsite** (higher reliability)
- Natural gas power generation with **pipeline firm transportation** agreements to ensure deliverability (higher reliability)
- Wind reliability... not so much
- Wind is an energy resource **NOT a capacity resource** – it can only be turned down and off, it is not dispatchable like fossil fuel resources

- What is the difference between an **energy-only market** and a **capacity market**?
- Will that answer explain who is to blame for the Texas Energy Disaster?



- Electricity production in the US is predicated on **reliability, affordability, and security**
- Large amounts of electricity **cannot be stored efficiently or economically**
- **Wind is an energy resource**, not a capacity resource
- Wind can only be **turned down or off**
- Did Texas politicians **stack the deck for wind energy?**





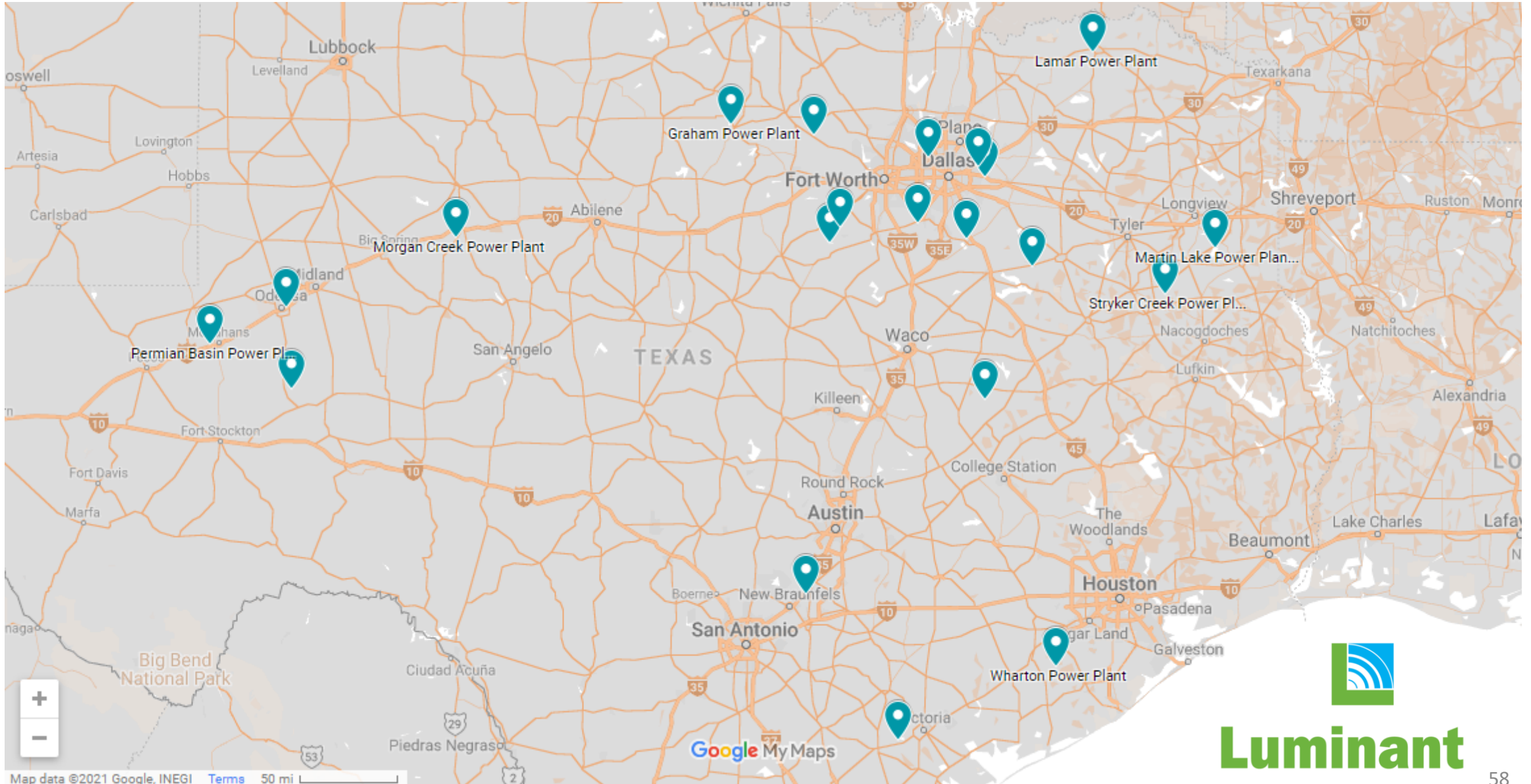
- In an energy-only market, some experts claim that **the short answer is “no one”**
- Under traditional utility models (capacity models) **generators who do not perform are penalized... severely**
- Capacity-driven markets (every other RTO and ISO in the US) account for the **value of reliability** in generation resources

# An Example of One Gas Fired Generator on ERCOT

## Luminant Gas Fired Generators in Texas (2021)

#	Power Plant	Capacity (MW)	Location
1	Morgan Creek	390	Colorado City, TX
2	Odessa – Ector	1,054	Odessa, TX
3	Permian Basin	325	Monahans, TX
4	Graham Power	630	Graham, TX
5	Wise	787	Poolville, TX
6	DeCordova	260	Granbury, TX
7	Lake Hubbard	921	Sunnyvale, TX
8	Lamar	1,076	Paris, TX
9	Forney	1,912	Forney, TX
10	Midlothian	1,596	Midlothian, TX
11	Ennis	366	Ennis, TX
12	Trinidad	244	Trinidad, TX
13	Stryker	685	Jacksonville, TX
<b>Total Capacity</b>		<b>10,246 Megawatts</b>	

# Luminant (Subsidiary of Vistra) Texas Facilities Map



**Luminant**

- How much natural gas supply is required on a daily basis to fuel the needs of Luminant gas-fired power plants in Texas (Assuming 7,000 heat rate)?
  - **1,721,333 MMBTU / Day**
- If you assume that natural gas pipeline Firm Transportation delivery contracts would be \$0.40 / MMBTU for each MMBTU of Luminant demand...
- **For approximately \$700,000 per day, Luminant through pipeline Firm Transportation contracts could guarantee deliveries of natural gas during peak time periods**



**Imagine the conversation...?**

- Luminant starts in the hole in any 5-minute auction if they have to guarantee pipeline deliveries by holding a Firm transportation contract 24/7/ 365 days a year
- Wind energy producers **didn't have to worry about connectivity issues**
- In fact, the Texas State Legislature proposed the CREZ (Competitive Renewable Energy Zones) **3,000-mile transmission project to connect 18,500 MW of electricity from the Panhandle/West Texas to population centers in Dallas/Fort Worth and Austin** because wind developers couldn't afford it
- Most every Texas ratepayer **pays around \$3–\$5 per month** (and will do so for a decade) for CREZ, a project that never would have been built if the wind developers themselves had to foot the bill
- The final buildout of CREZ cost nearly **\$7 billion of taxpayer dollars**