

An Inconvenient Reality:

Has ERCOT or the Texas Legislature Solved Natural Gas Producer's Supply Chain Issues?

Presented to:

TIPRO

Summer Conference

September 2, 2021

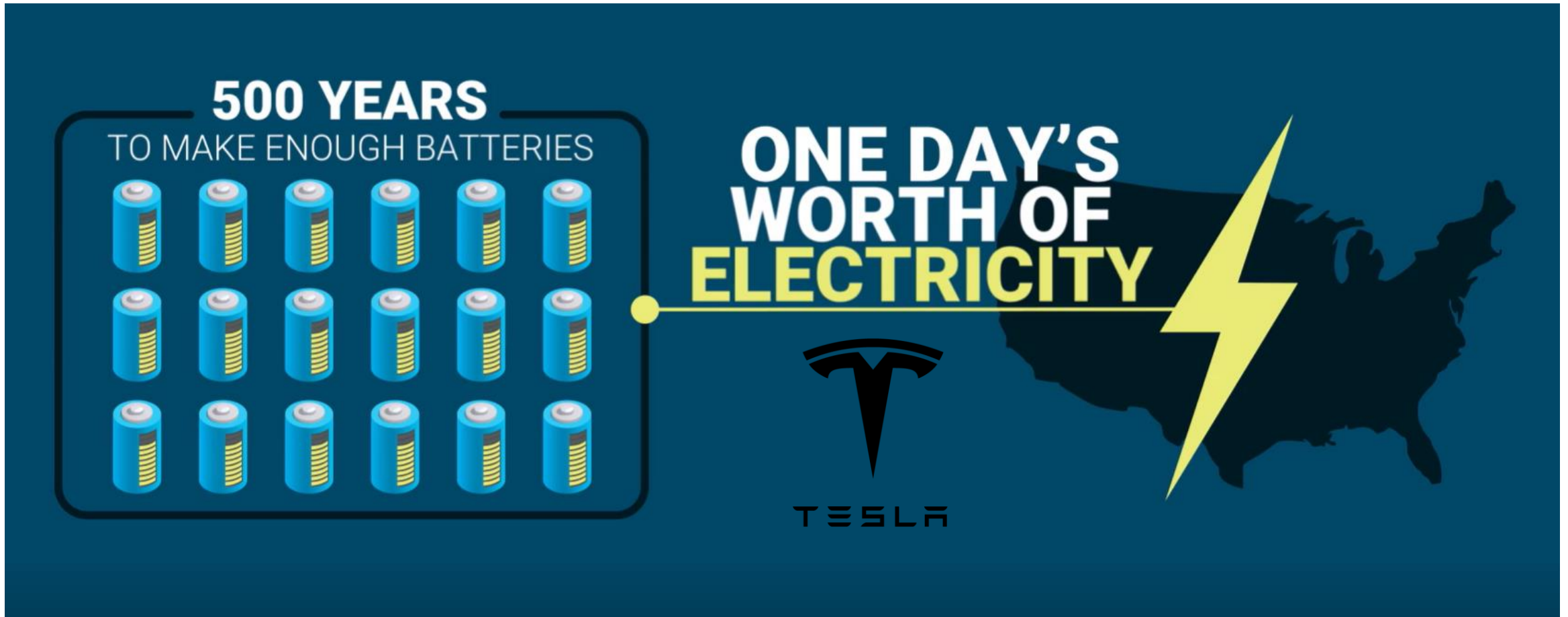


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- Electricity cannot be stored on a utility scale
- Wind and solar energy are not dispatchable
- Market dislocations occur when society attempts to mix a socialized market with a profit-motive market

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**

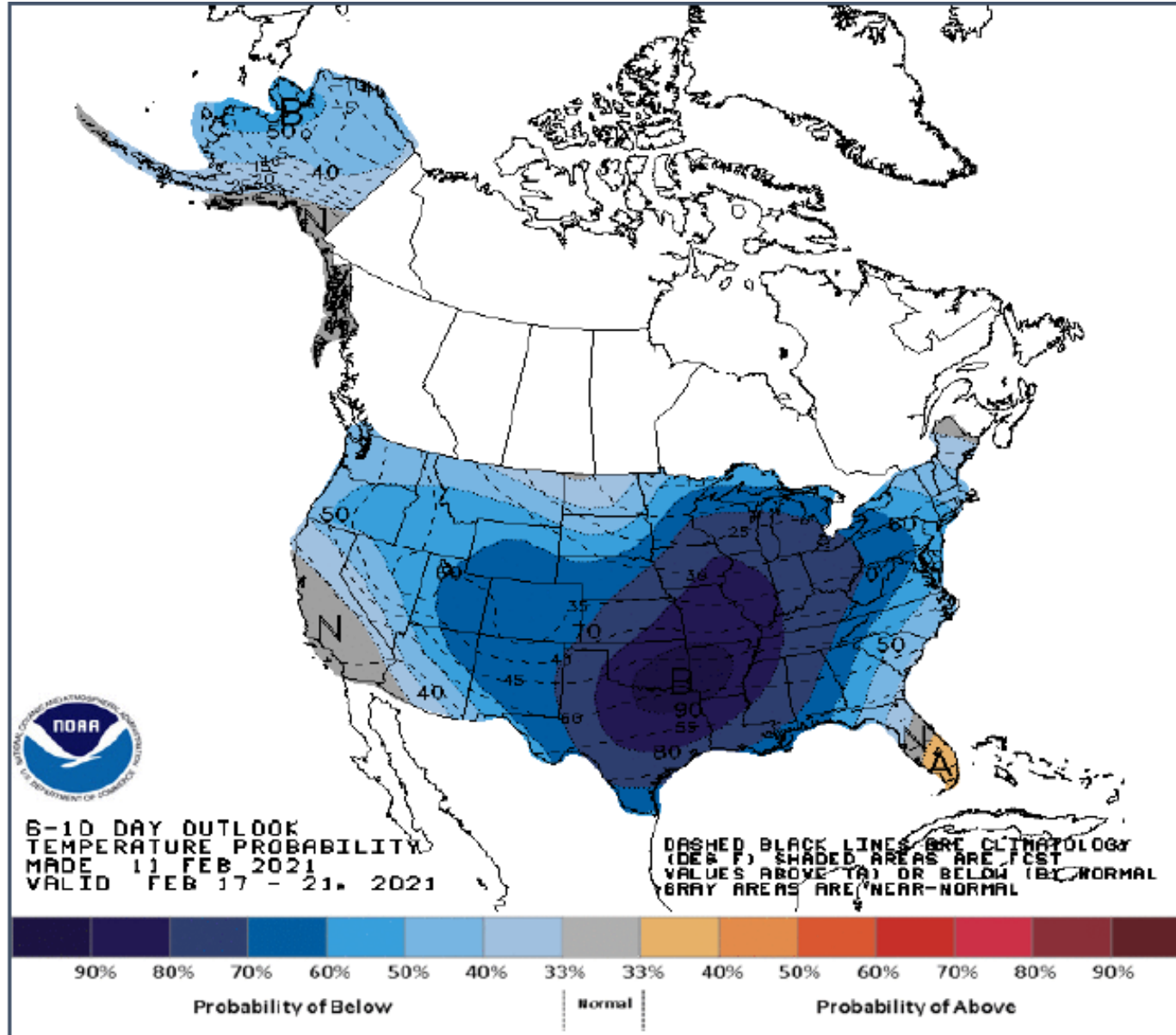


Source: "What's Wrong with Wind and Solar?", PragerU, Mark Mills, September 14, 2020

- **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
- **\$200 billion in losses, 700 people dead**

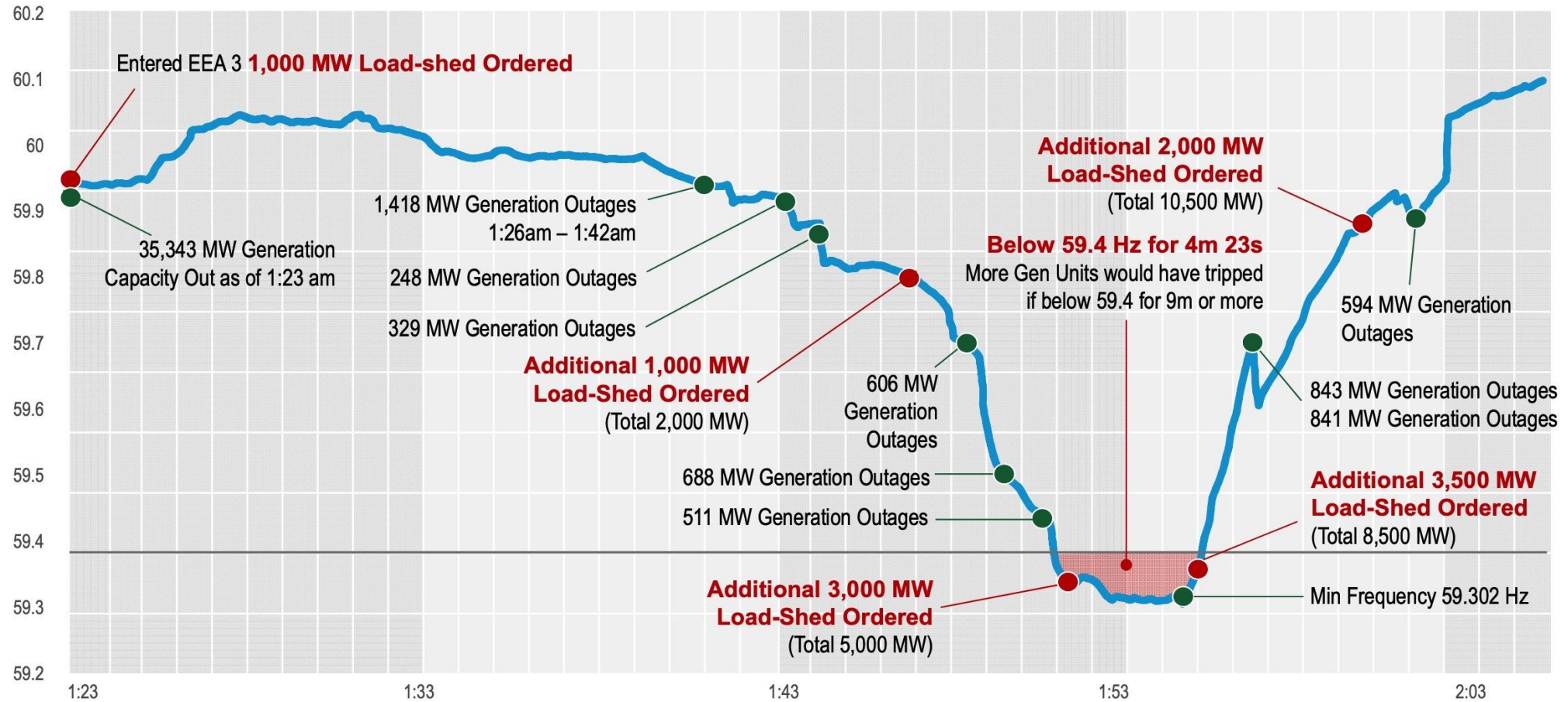


6 – 10 Day Outlook on February 12, 2021

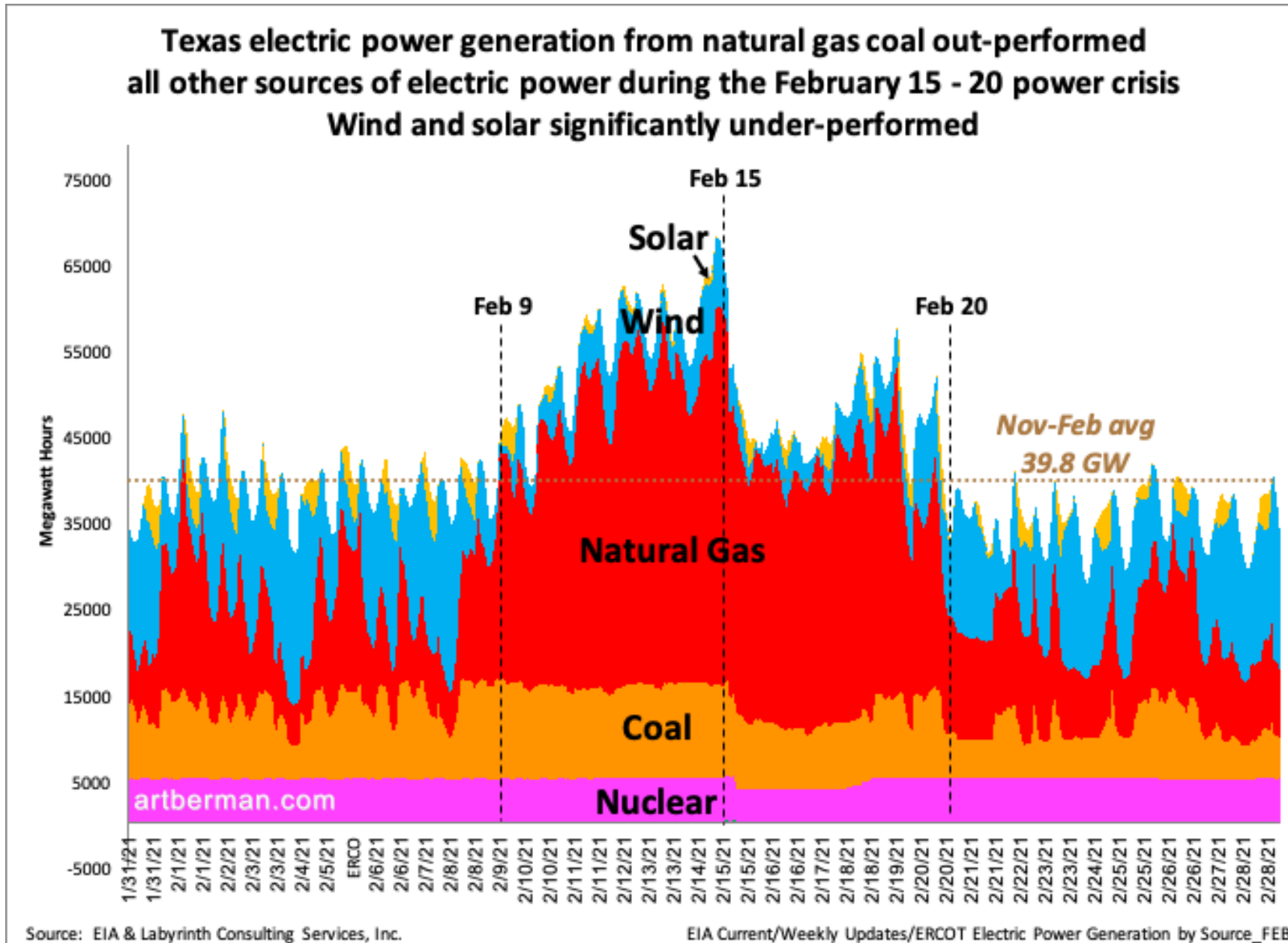


Source: CIMA Daily Weather and Market Report, Friday, February 12, 2021

Rapid Decrease in Generation Causes Frequency Drop



The Perfect Storm: February 12 – 18, 2021



Monday, February 8th through Tuesday February 16th:

Wind  93%

Coal  47%

Natural Gas  450%

“All performed as expected...”

- Natural gas relies on electricity to operate:
 - Wellhead electric compression
 - Gathering pipeline/field electric compression
 - Gas storage compression Processing plant facilities (to run control systems)
 - Interstate/Intrastate pipelines electric compression
 - LACT (Lease Automatic Custody Transfer) unit electric pumps

- Expedited gathering system installation
- EPA air permit avoidance... producers chose “pole power” over natural gas compression to avoid EPA air issues





- Despite prior examples of rolling blackouts and their impact on natural gas production (see 2011 outage in West Texas)
- ERCOT failed to recognize any priority for natural gas infrastructure when mandating rolling blackouts



When you are in a hole, stop digging.

- Andrew Barlow, spokesman for the Texas Public Utility Commission, said that a “system glitch” caused the price for electricity to **remain artificially low at \$1,200 per MWh**
- According to spokesman Barlow, that is why the TPUC **ordered the price be fixed immediately** (on Monday, February 15th) at \$9000 per MWh



Frozen pipelines don't thaw out any quicker at \$9,000 per MWh than they do at \$1,200 per MWh



Producer Economics vs. Socialized Electricity Supply

Midstream Reality

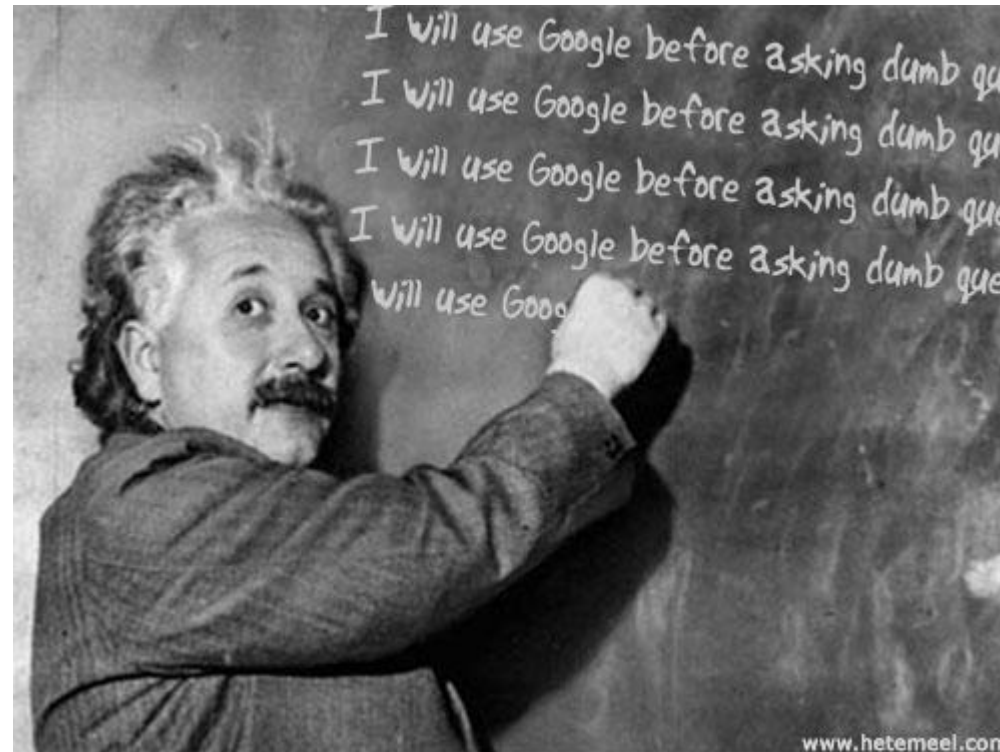
- 80% of producer's monthly payment for natural gas is based on a First of the Month price index
- 20% of the monthly payment is based on a daily price index for natural gas
- Ex. - February 2021 WAHA FOM price: \$2.49 per MMBtu

Midstream gas gathering companies pass through their electric related compression costs directly to producers

Example:

- \$25 per MWh = \$0.14-0.16 per MMBtu of electric cost
- At \$9,000 per MWh = \$50.40 per MMBtu

- As a producer, would you pay \$50.40 per MMBtu in gathering charges to receive a price of \$2.49 per MMBtu?
- Force Majeure became Price Majeure



- 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.
- **\$9,000 / MWh 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 MWh price was left in place too long, **which cost the Texas wholesale electricity market +\$16 billion**

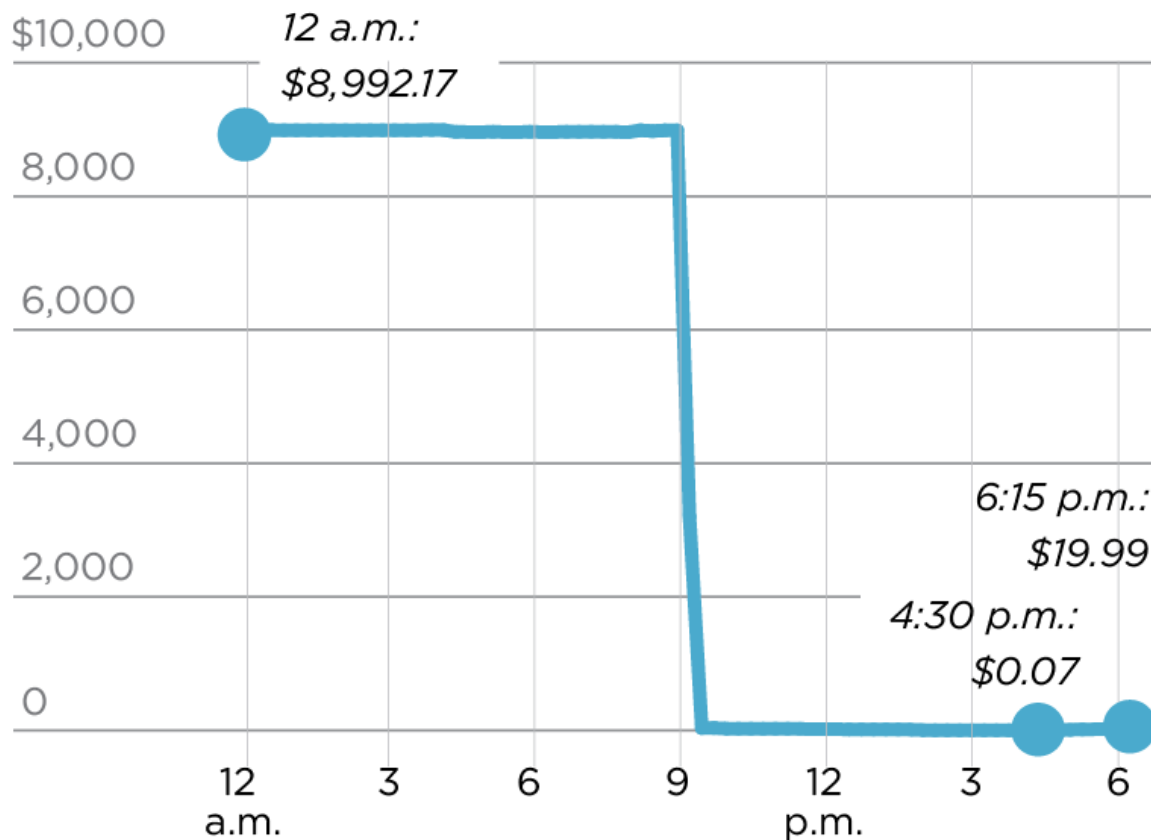
FEBRUARY 2021

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						

- A \$9,000 per MWh 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

Electricity market prices in Texas

Prices fell on Friday from the week's peak of \$9,000 per megawatt hour to under \$1.



SOURCE: ERCOT

Staff Graphic

The Solution:

- ERCOT and the Texas Legislature must address this issue by creating a “look-back” electricity tariff that applies to critical natural gas infrastructure.
- That look-back tariff would eliminate the existing disincentive to produce natural gas when electricity prices sky-rocket.

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The infrastructure failures in Texas are quite literally what happens when you *don't* pursue a Green New Deal.

10:00 PM · Feb 16, 2021 · Twitter for iPhone

54.7K Retweets **6,720** Quote Tweets **432.9K** Likes



February 17, 2021



AOC's Former Chief of Staff Admitted Green New Deal Not About Climate Change

“The interesting thing about the Green New Deal, is it wasn't originally a climate thing at all... Do you guys think of it as a climate thing? Because we really think of it as a how-do-you-change-the-entire-economy-thing.”

Fox News, Washington Post Magazine, July 7, 2019

What did Socialists use for light before candles?



Electricity



Questions?



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



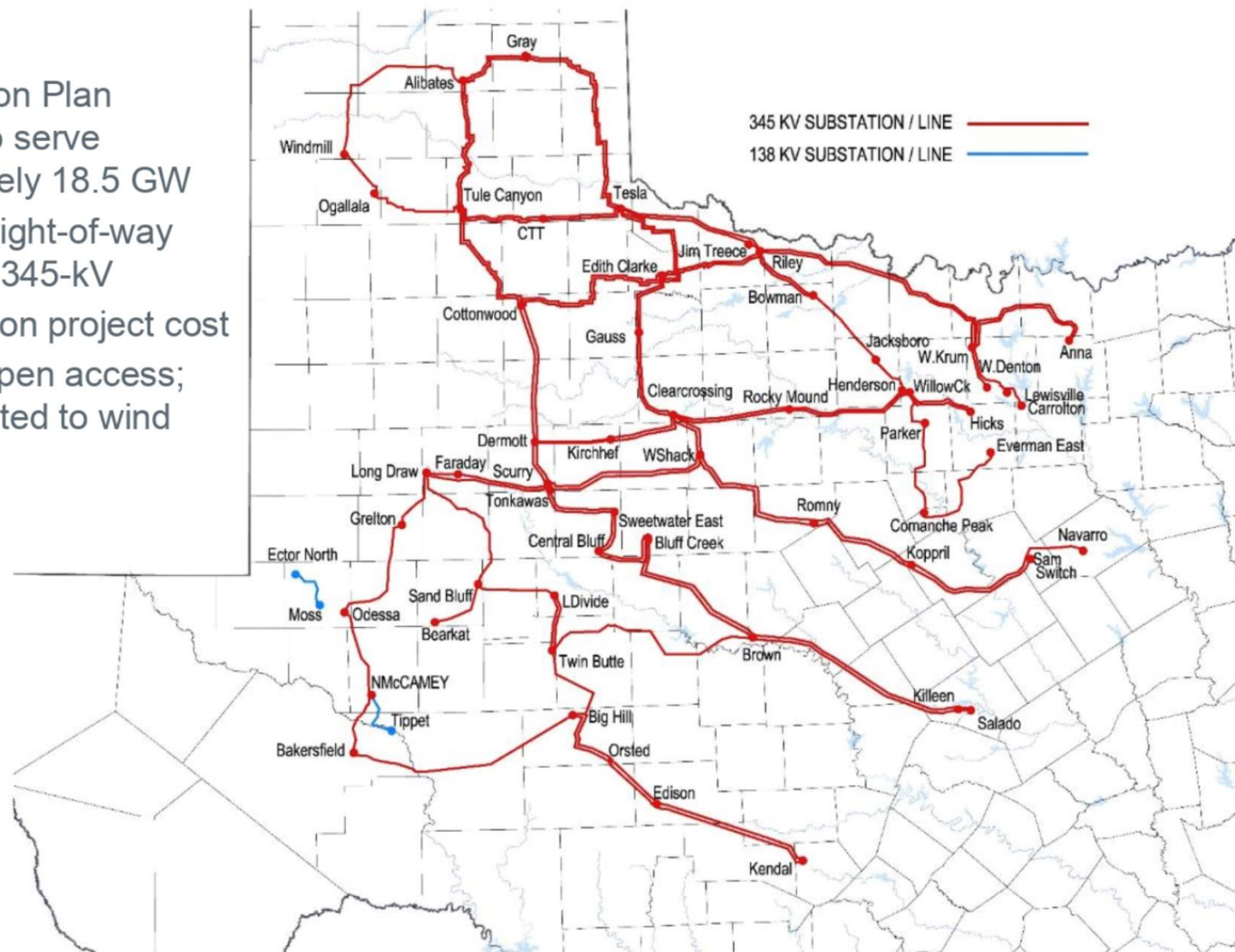
- 1. Texas (28,843 MW)**
- 2. Iowa (10,201 MW)**
- 3. Oklahoma (8,172 MW)**
- 4. Kansas (6,128 MW)**
- 5. California (5,973 MW)**

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>
Total	\$36.0 billion +
Average Annual Cost	\$1.50 billion +
Current Annual Cost	\$2.47 billion +
% of ERCOT 2018 Total \$ Sales	7.8% +
% of ERCOT Renewable \$ Income	28.8% +

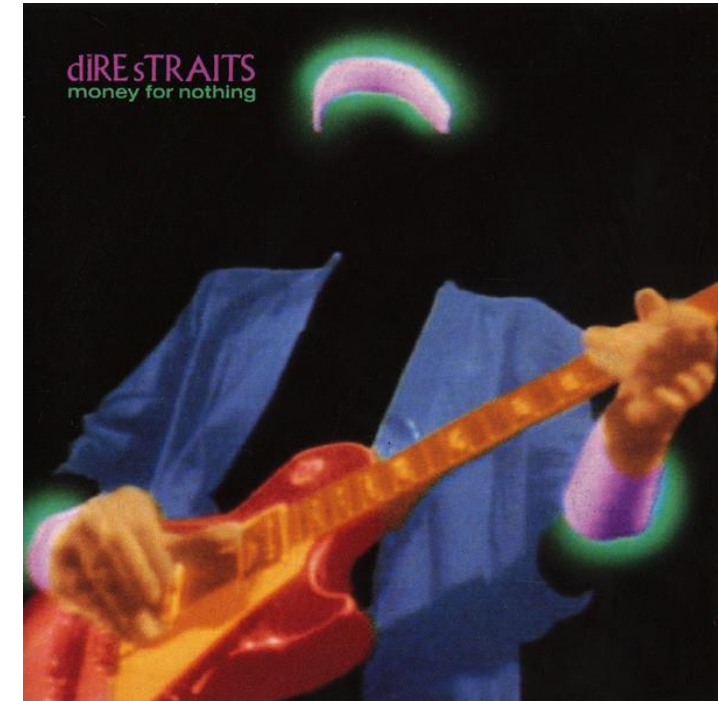
Other Wind Subsidies in Texas

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
Subtotal	\$3,054	\$19,380	32,097
Share of PTC Market	71%	76%	59%
TOTAL	\$4,298	\$25,474	54,528

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”



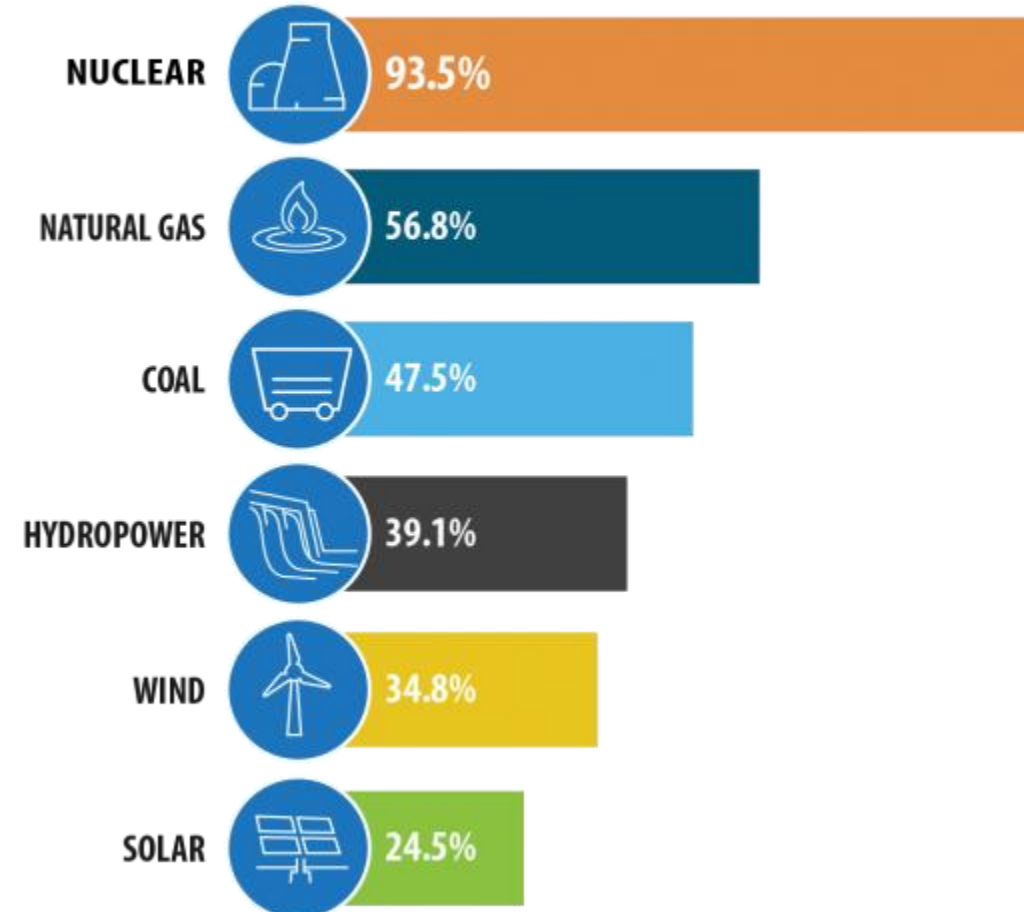
As noted by the head of the PUC in Texas, an energy only market can fuel diversification towards intermittent resources. It does this because it rewards only energy that is fed into the grid, not backup power.

- 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

- 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...”



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?

Appendix



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- Fox News, Rove Reacts to Texas Power Grid
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- *Ed Hirs Has Been Predicting This Mess for Years*, Texas Monthly, Mimi Swartz, February 19, 2021
- *Colorado PUC In the matter of the application of Public Service Company of Colorado for approval of its 2007*
 - *Colorado Resource Plan, Direct Testimony and exhibits of James F. Hill - The effective load carrying capability (“ELCC”)*
- *Government Support for Intermittent Renewable Generation Technologies*, Arthur Campbell, April 6, 2009, MIT Department of Economics
- “A Report to Congress and the States Pursuant to the Sections 1234 and 1832 of the Energy Policy Act of 2005”, United States Department of Energy, February 2007
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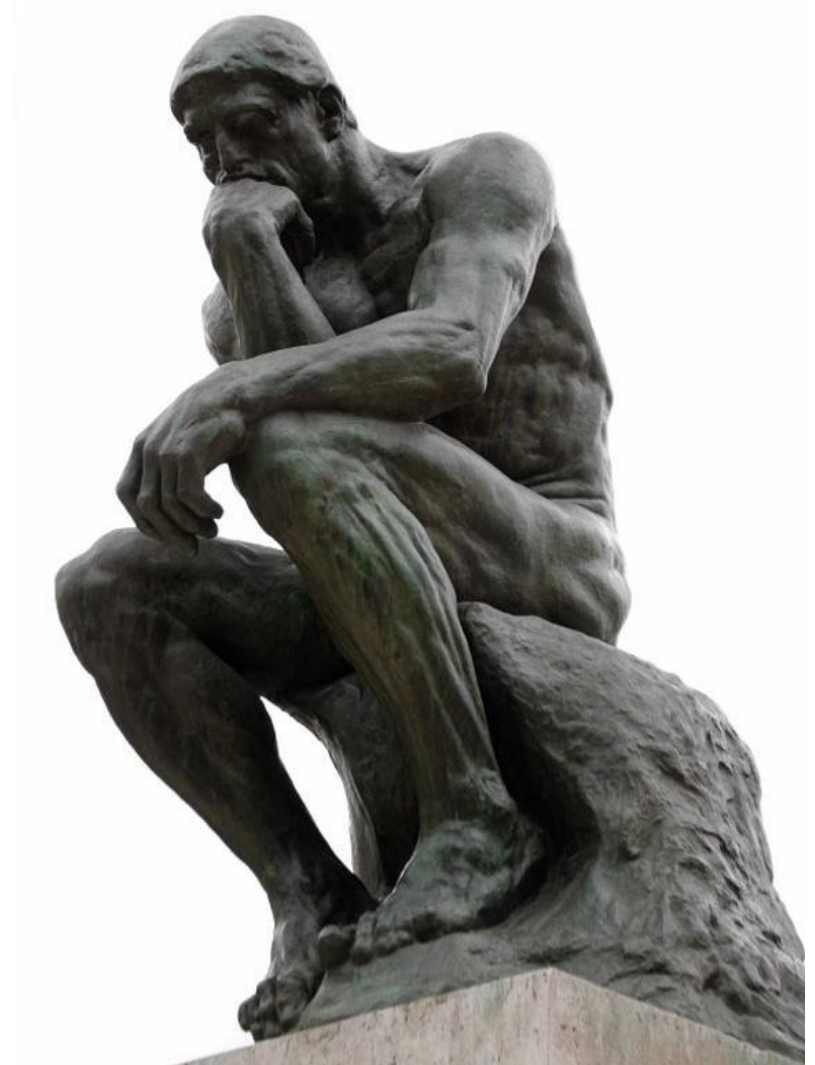
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- The **capacity factor (CF)** of an electric power plant is the **ratio of its actual output** over a period of time **to its potential output** if the plant could operate 100 percent of the time
- The CF for a power plant is calculated by **dividing** 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?**



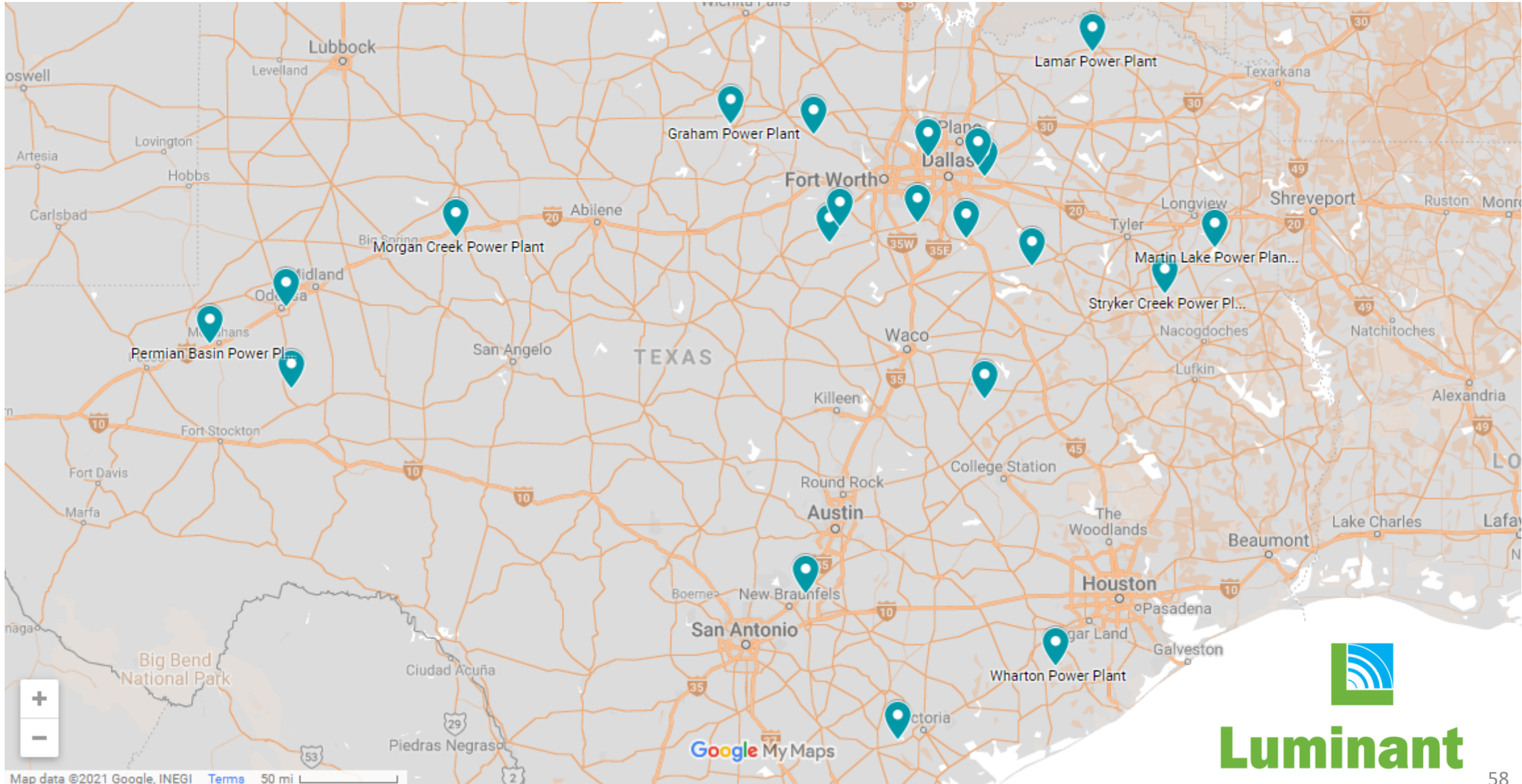
- In an energy-only market, some experts claim that **the short answer is “no one”**
- Under traditional utility models (capacity models) **generators who do not perform are penalized... severely**
- Capacity-driven markets (every other RTO and ISO in the US) account for the **value of reliability** 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
Total Capacity		10,246 Megawatts	

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**