

2022 Urban Counties Education and Policy Conference

Texas, Renewable Energy & the Energy Transition

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January 13, 2022

Agenda



1. The Energy Transition
2. ERCOT: Ground Zero
3. Where From Here: ERCOT, Grid of the Future

About Andy Bowman

CEO of Jupiter Power LLC, 2017–present. Jupiter is a leading energy storage company with deep trading, analytics, development, finance, operations and construction capabilities. Jupiter currently has 654MWh of battery projects in operation or under construction, including largest battery storage project in ERCOT (200 megawatt-hours).

Author, *The West Texas Power Plant That Saved the World*, Texas Tech University Press 2021

Previously CEO of Pioneer Green Energy LLC 2009–2015; Chief Development Officer of E.On Climate & Renewables US 2005–2008; CEO of Renewable Generation Inc. 2001–2004

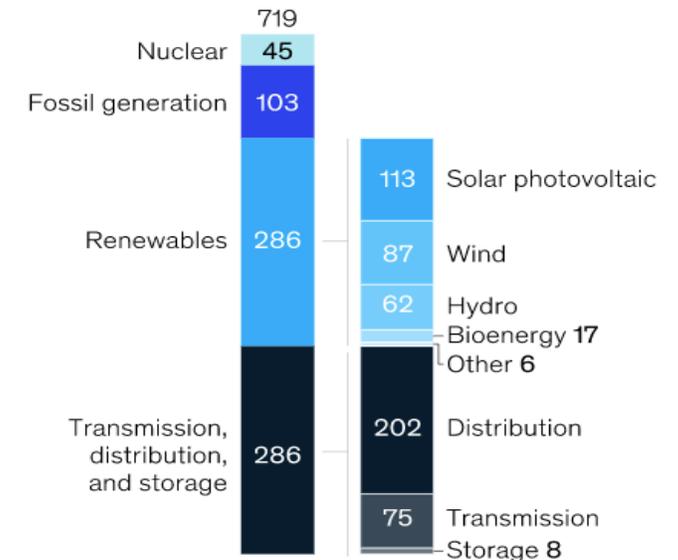
What is the “Energy Transition”

McKinsey & Co.: “A transformational switch away from fossil fuels and into renewable and clean sources”

- Renewables are becoming cheaper than fossil fuels
- Demand for electricity will grow quickly, while demand for other energy sources, such as oil, will fall
- Variability of demand and supply are increasing, increasing the need for DSM and storage
- Coal and oil will peak “in the next decade” while gas will grow moderately
- CO₂ emissions will “plateau by 2030” but remain well above +2C temperature increase levels

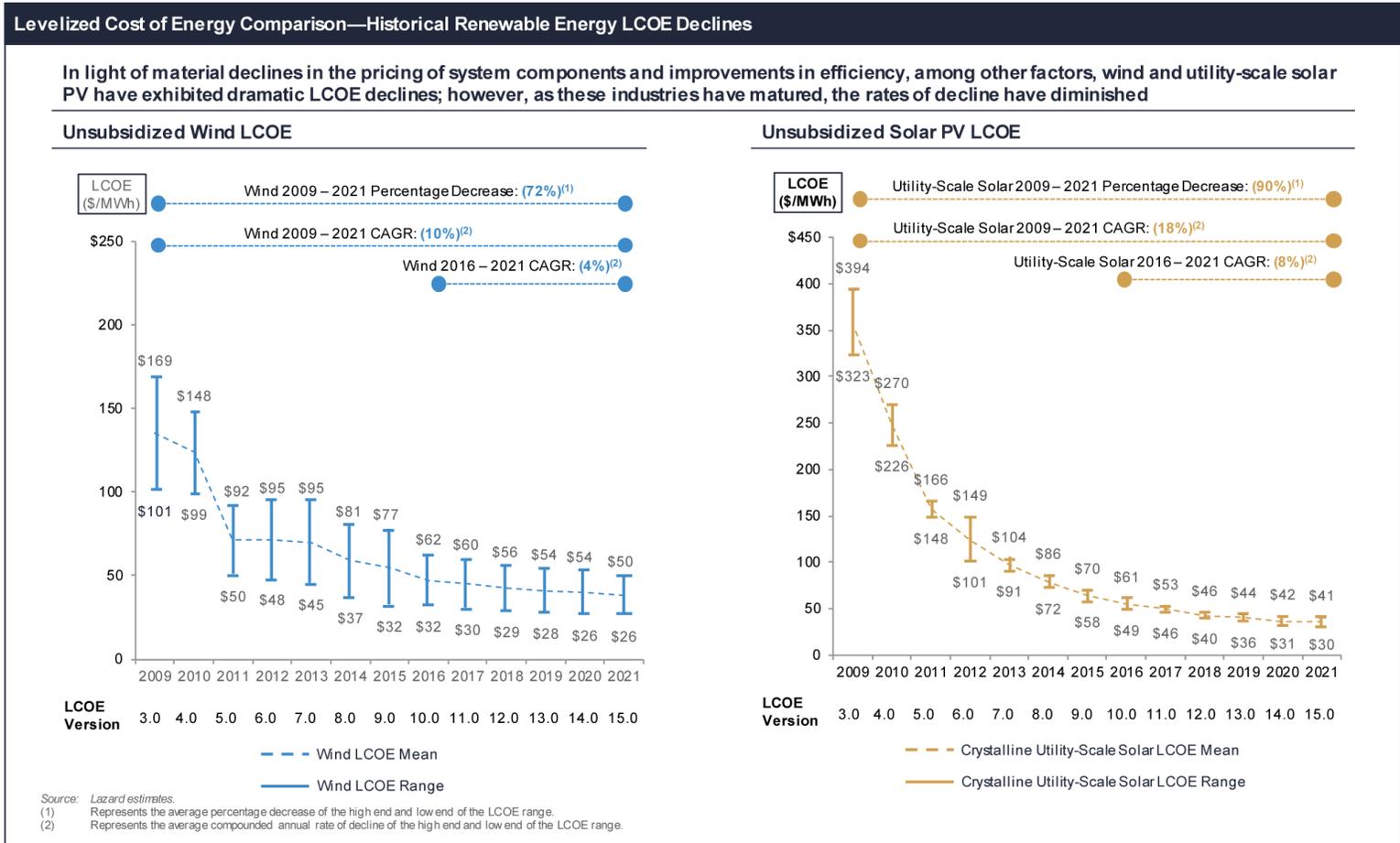
Renewables will represent 40 percent of average annual global energy investments to 2025.

Estimated average annual power-sector investments globally,¹ € billion,² 2018–25



Note: Figures may not sum to listed totals, because of rounding.
¹IEA new-policies scenario.
²Converted from original in 2017 dollars, using average exchange rate.
Source: Bank for International Settlements; *World energy outlook 2018*, IEA, November 2018, iea.org

The “Energy Transition”: Cheap Renewables

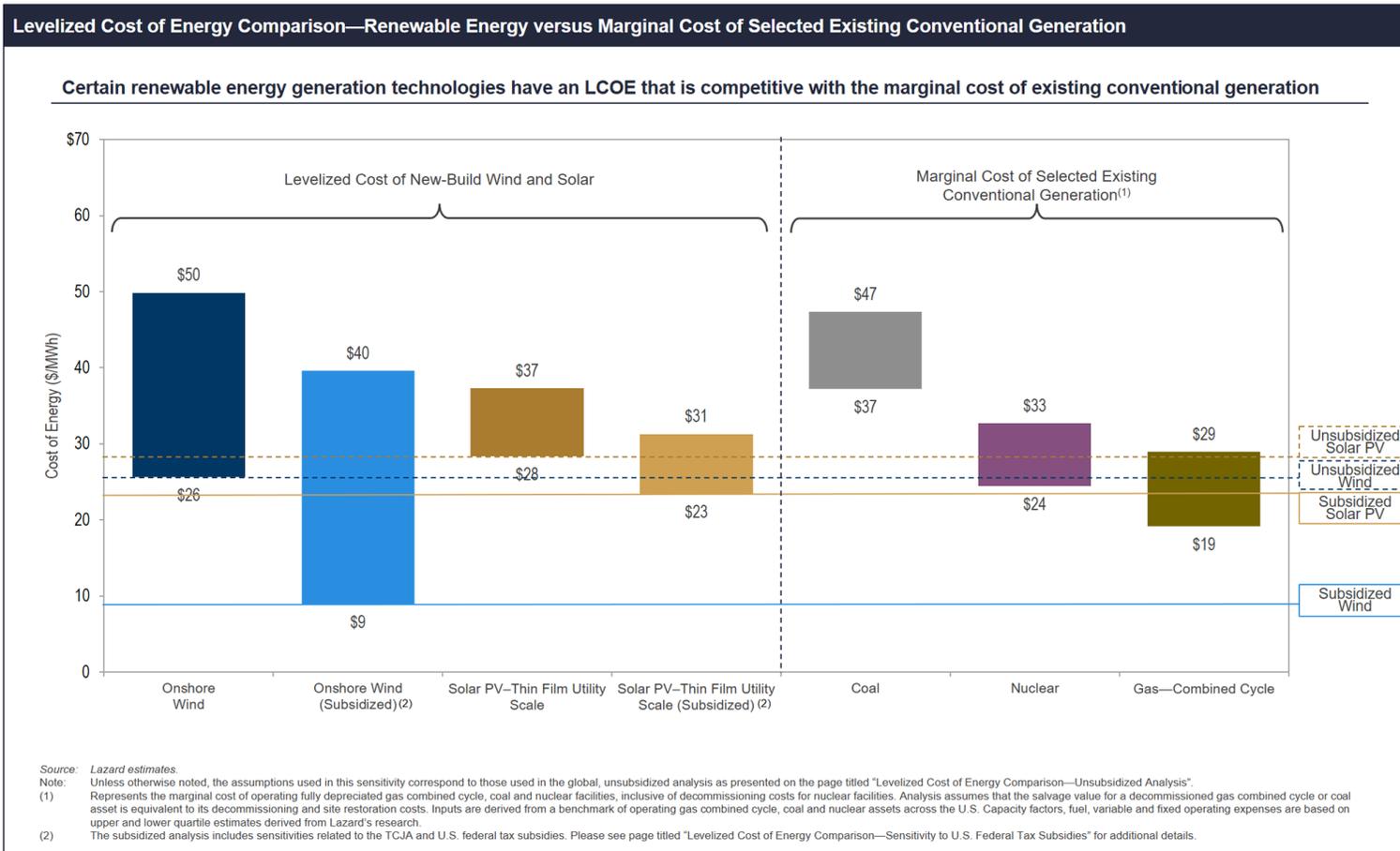


Persistent, substantial declines in the price of power from wind and solar over last 20 years underpin the Energy Transition

Even facing tariffs and tapering off of tax incentives, falling renewables’ prices makes them more competitive over time

Any reduction in fossil fuels incentives and/or price on carbon will likely increase renewables’ advantages

The “Energy Transition”: Cheap Renewables



Price reductions in wind and solar have been so substantial over last 20 years that they are now competing favorably in power markets with fossil fuels – on both a subsidized and unsubsidized basis

This is particularly the case with solar, which provides power during the highest demand hours

Price patterns forecast even greater market share gains

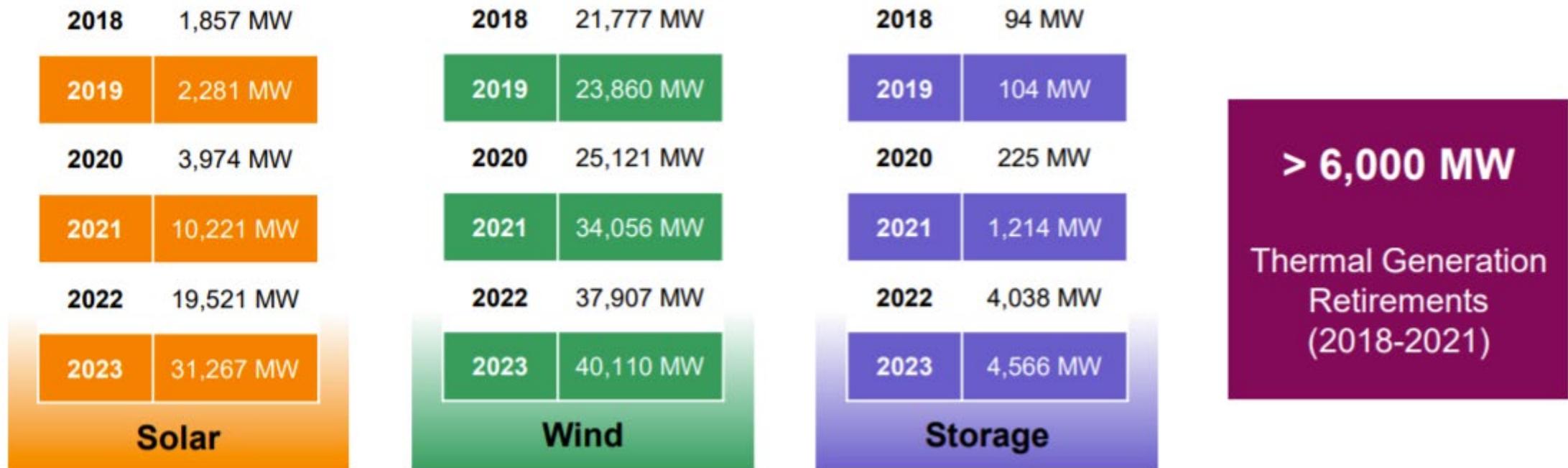
ERCOT: Energy Transition Ground Zero

Several titanic “Energy Transition” forces are now simultaneously unfolding in ERCOT:

- Massive increase in non-dispatchable power (wind, but especially solar)
- Coal retirements, and negligible gas growth
- Large-scale deployment of energy storage and demand response
- Recovery of oil & gas load growth from pandemic
- Unprecedented growth in datacenter/Bitcoin load
- Market redesign underway by PUCT arising from Storm Uri
- Potential “Build Back Better” policy support

ERCOT: Energy Transition Ground Zero

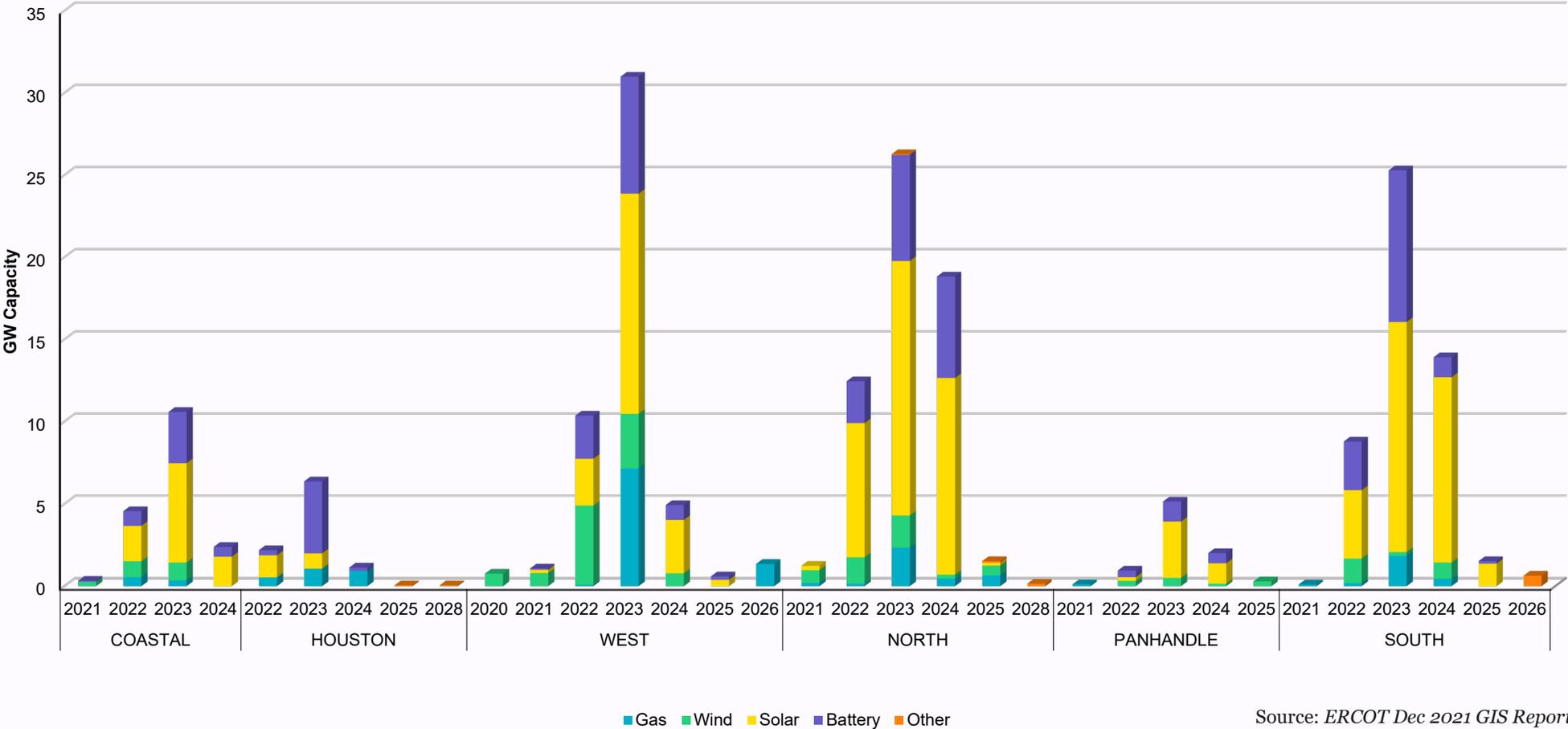
ERCOT forecasts spectacular additional growth in solar, wind and storage installations over 2020–2023, and even more +2023, while 6GW+ of fossil plants have retired and little to no new fossil is in queue



New Project Queue: Only renewables on way



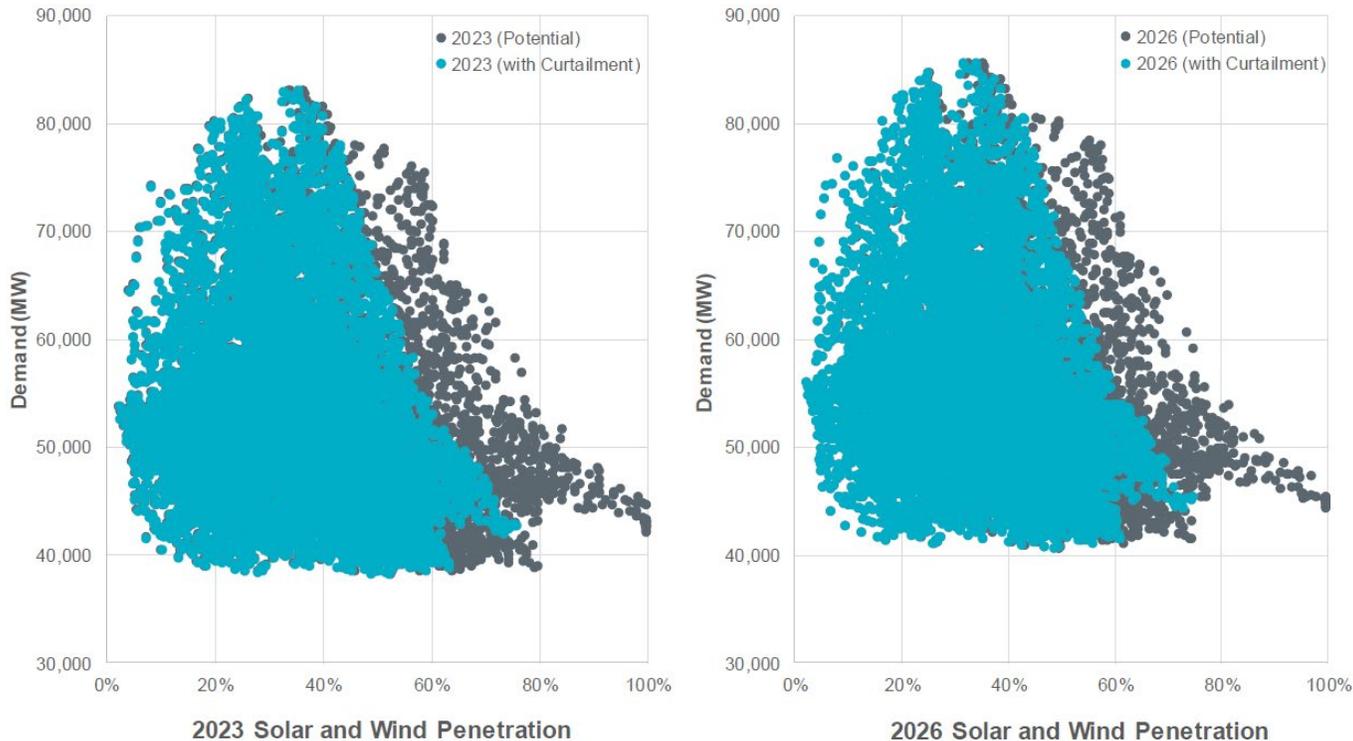
Capacity for Planned Projects by Projected In-service Year and CDR Forecast Zone



Source: ERCOT Dec 2021 GIS Report

ERCOT: Unprecedented Renewables Penetration

Renewable Generation Penetration



Consequence of massive renewables growth + fossil retirements:

- ERCOT will regularly see renewables making up 40-50% of our daily total generation, occasionally near 80%, and theoretically up to 100%
- Likely no grid in the world has seen this pattern of huge daily deliveries of renewables occur as regularly as ERCOT should by 2023
- Paired with other changes occurring in ERCOT now, very difficult to predict all the associated impacts

ERCOT: Unprecedented Bitcoin/Datacenter Growth

Business

Texas Plans to Become the Bitcoin Capital, Vulnerable Power Grid and All

Crypto miners with more than double the power demand of Austin are descending on the anti-regulation state.

By [Naureen S Malik](#) +Follow
November 19, 2021, 9:00 AM CST

Why bitcoin entrepreneurs are flocking to rural Texas

Mining cryptocurrency requires lots of cheap energy and many miners have settled on Texas as their destination

THE FUTURE OF WHAT'S NEXT

Can Texas' Power Grid Withstand Cryptocurrency Mining?

The state's low-cost energy is a great draw for those looking to expand the cryptocurrency industry. But mining the digital currencies consumes a lot of power and some experts aren't certain that the state's power grid can withstand the stress.

Oct 2, 2021, 11:12pm EDT | 61,965 views

Texas Poised To Be A World Leader In Bitcoin And Blockchain



Jason Brett Contributor 
Crypto & Blockchain
I write about blockchain regulation and policy.

Cryptocurrency mining power consumption in Texas could increase five times by 2023: ERCOT

Texas is the only US state which operates its own internal power grid. This is managed by the nonprofit ERCOT and provides at least 90 per cent of the state's electricity.

BUSINESS

Inside the Extremely Hot Business of Bitcoin Mining in Big Spring

A Minnesota company is hunting for cryptocurrency on the eastern edge of the Permian Basin—with plans for a big expansion in Texas.

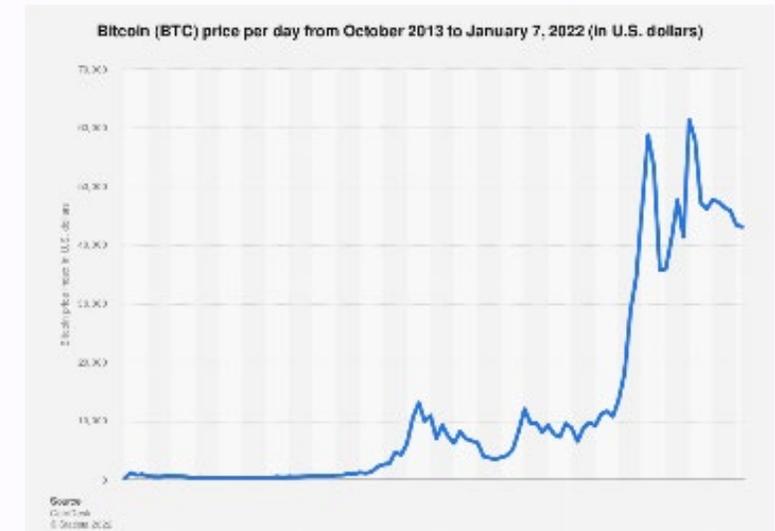
Consequence of massive bitcoin build wave:

- Information is opaque about how much is coming, but credible estimates are 15-20GW is in development, 7-8GW “real” now
 - ERCOT = 80GW total gen
- Likely that no grid in the world has seen this proportion of load additions materialize over such a short period
- Introducing this vast quantity of new load so quickly will create associated impacts very difficult to foresee today

What is Bitcoin?



**Very complicated algorithms, but very simple from a power markets point of view:
Computers + Electricity 24/7 = Bitcoin**



ERCOT: Return of Oil & Gas Production

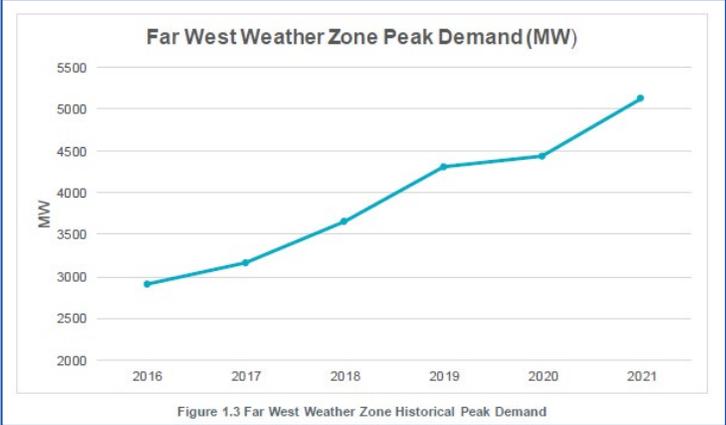
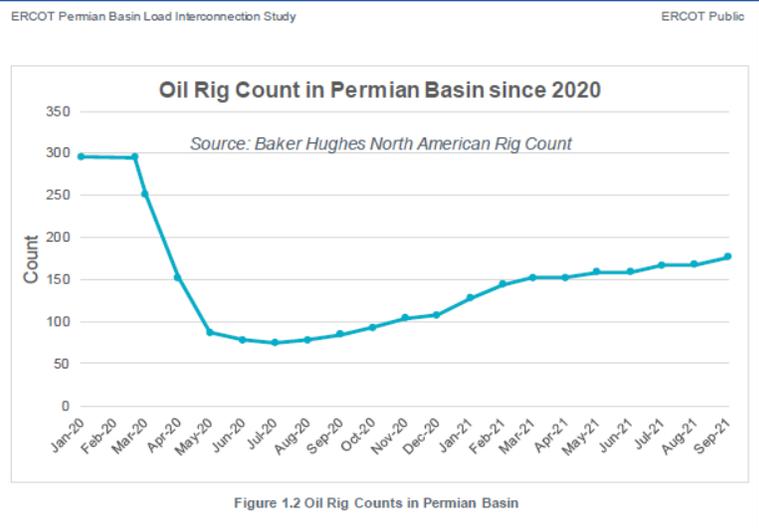
Table 2.2 Permian Basin Load Projection for Year 2025 and 2030 in the Study

Permian Basin Load	IHS Load Forecast (MW)		2020 RTP (MW)
	2025 Load	2030 Load	2025 Load
Total Load at Existing Substations	6,601	7,402	8,343
Total Load Requiring New Transmission Interconnections	1,850	2,568	n/a
Total Load	8,450	9,970	8,343

In addition to new bitcoin/data center load, O&G load is also recovering quickly

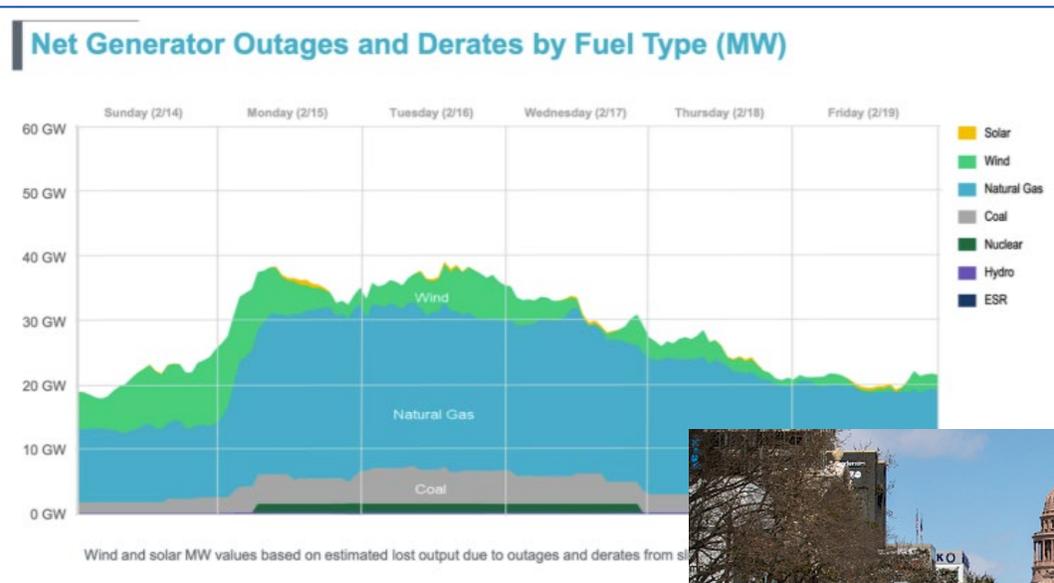
- ERCOT forecasts 8.5GW of new load requirements by 2025, mainly in West Texas

- Convergence of O&G 24/7 load demands with new Bitcoin 24/7 load demands, on top of constrained, renewables driven West Texas grid, is expected to create significant pricing volatility – even more than already present



Source: ERCOT Permian Load Interconnection Study, December 2021

ERCOT: Storm Uri & Market Redesign; BBB



Political/policy response to Uri is to address ERCOT market design:

- PUCT has initiated reconsideration of key facets of ERCOT market
- Major considerations are weather proofing generation and gas supply and strengthening power & ancillaries markets; Underlying issue is that ERCOT continues to be only US grid with no capacity market – instead, relies on scarcity pricing
- Build Back Better would increase incentives for solar, wind and storage, making them even more competitive

PUC approves having ERCOT begin market redesign amid grumbles from skeptics

by Christian Flores | Thursday, December 16th 2021



Where from here? ERCOT, Grid of the Future



It is no exaggeration to say that the next few years will bring truly historic change to ERCOT

While grids in California, Germany, China and Denmark have seen incredible changes from the “Energy Transition,” none will hold a candle to the scale of changes coming to Texas over just a handful of years

In many ways, ERCOT is mapping the future of the electricity business: rapid decarbonization happening in the midst of intense technologic change, causing regional and system-wide generation/transmission constraints and posing novel reliability and market design challenges

Where from here? ERCOT, Grid of the Future

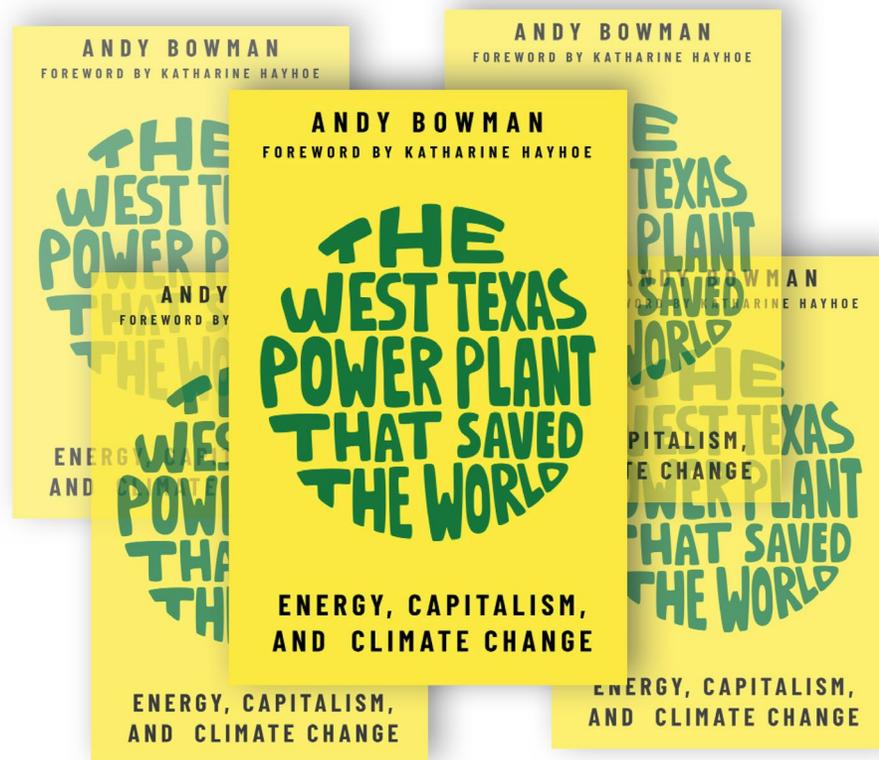


Texas policymakers have not sought to become a world leader in renewables and the Energy Transition, but it has happened nonetheless. Signs are positive that leaders at PUCT/ERCOT are taking up the challenge and bringing a Texas-style answer to the table

One hopes that politics do not enter into the picture too much, but they inevitably will with the 2022 and potentially 2024 election cycles both teed up to litigate Storm Uri and Texas' unique approach to electricity markets

Importantly, the appearance of Bitcoin and cost competitive energy storage are just-in-time arrivals on the scene, offering new capabilities to instantaneously affect load demand at GW scale – creating a robust capability to match our increasingly fickle GWs of generation changing with the weather. But there are a great many unknowns

The West Texas Power Plant That Saved the World



“With vivid stories and incontrovertible facts, Andy Bowman makes it clear that climate impacts are not a future problem; they are here and now, affecting all of us in ways that matter. But he also explains how solutions are here today as well. They do not involve a return to the Stone Ages or a complete destruction of our energy-intensive way of life. Instead, from homegrown Texas solar to far-off Chinese investment, the world is already changing. Clean energy is already here. And the future can be bright.”

--Katharine Hayhoe, from the foreword

Available at: <https://www.andywbowman.com/>