

ENERGY MARKETS

ASA HOUSTON 2023 ENERGY VALUATION CONFERENCE

MAY 11, 2023

Ed Hirs

edhirs.com

713-961-9661

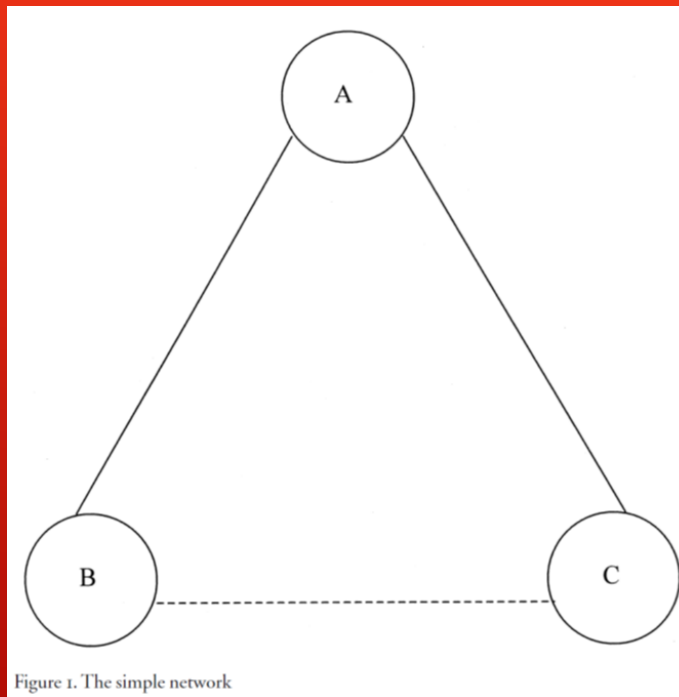
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VALUATIONS

Fundamentals—
Revenue > Cost
Time

Comparatives—
Similar metrics

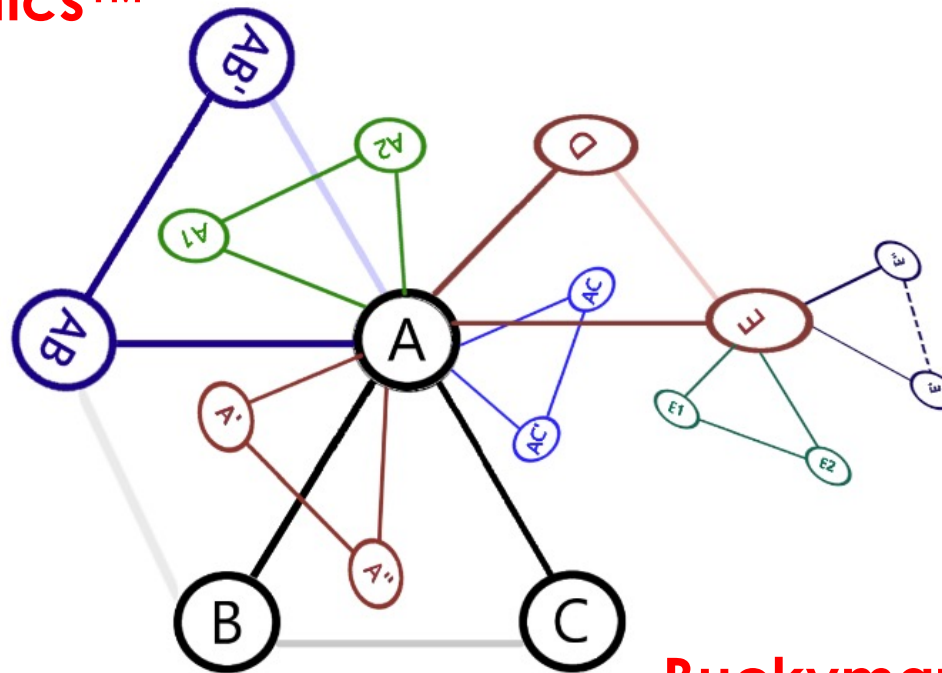
ENERGY MARKETS ARE NETWORKS



Paul W. MacAvoy

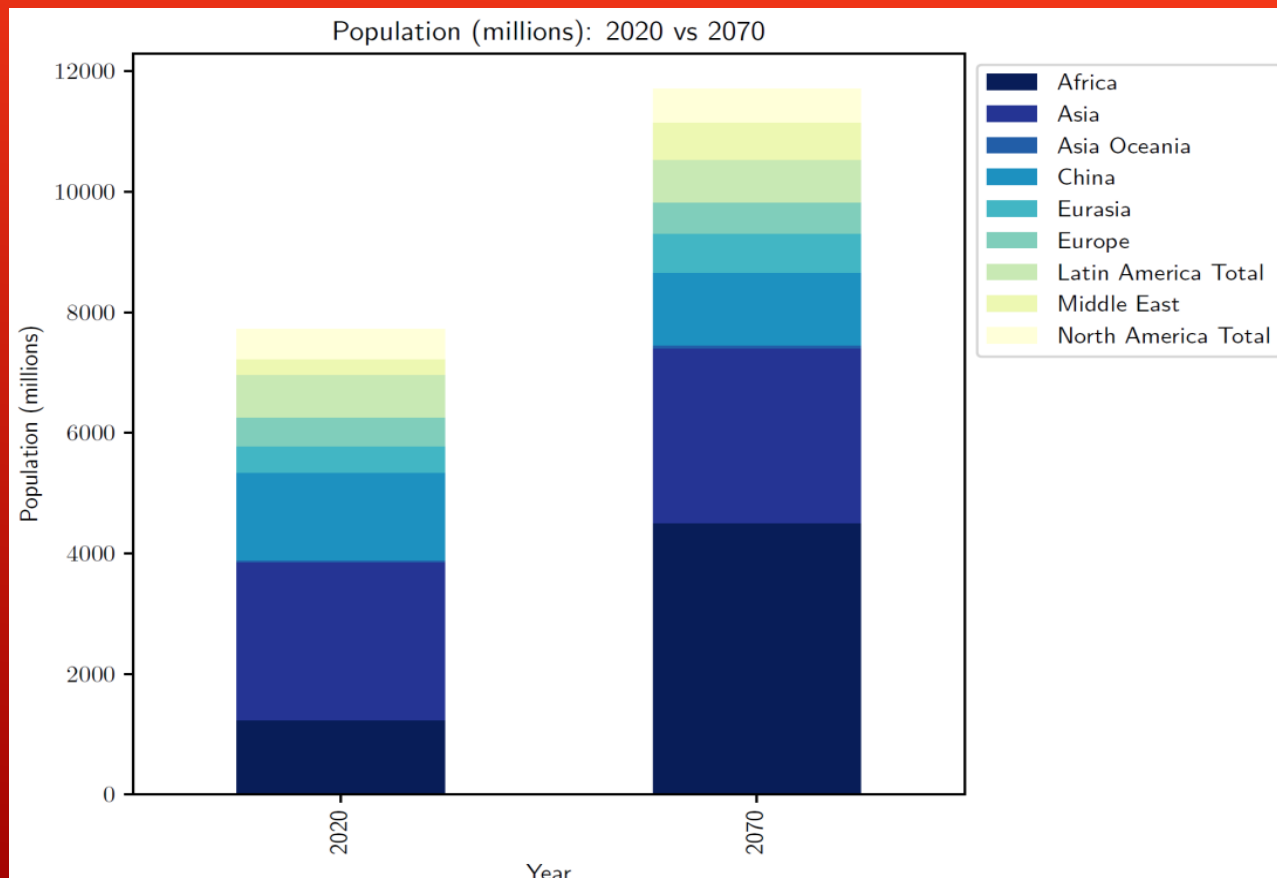
ENERGY MARKETS ARE NETWORKS

Buckynomics™

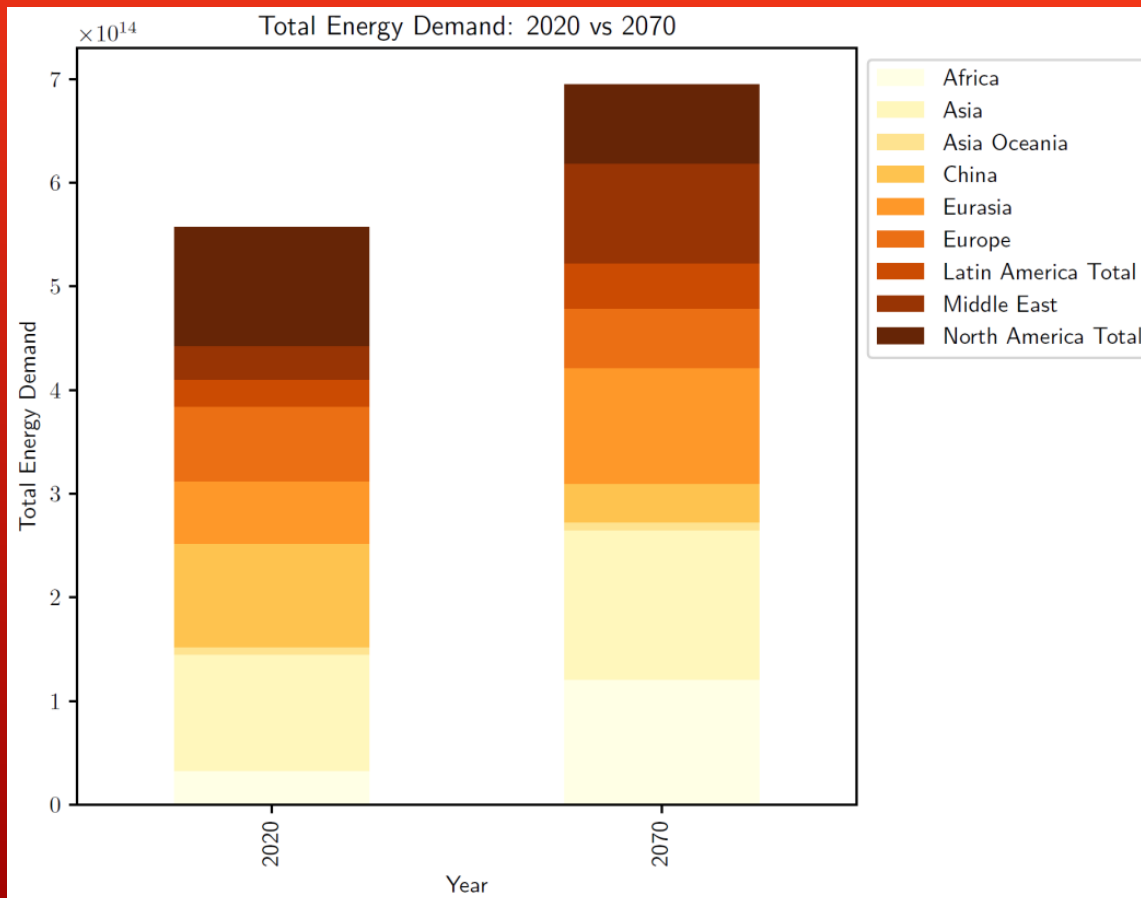


Buckymarkets™

UH ENERGY FORECAST PROJECT



UH ENERGY FORECAST PROJECT

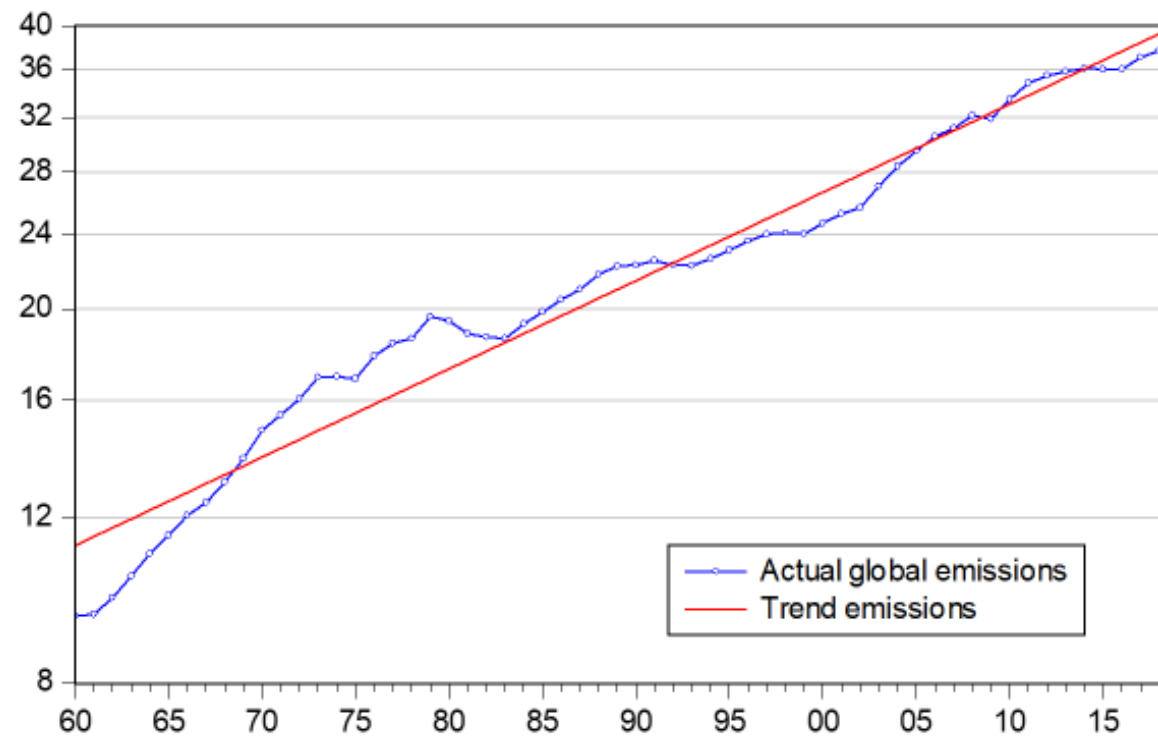


THE ENERGY TRANSITION IS HERE

- UH Hobby School of Public Policy and Yale Center for Climate Communications Agree—polling is 75% favor reducing emissions
- Two ways to reduce carbon dioxide in the atmosphere

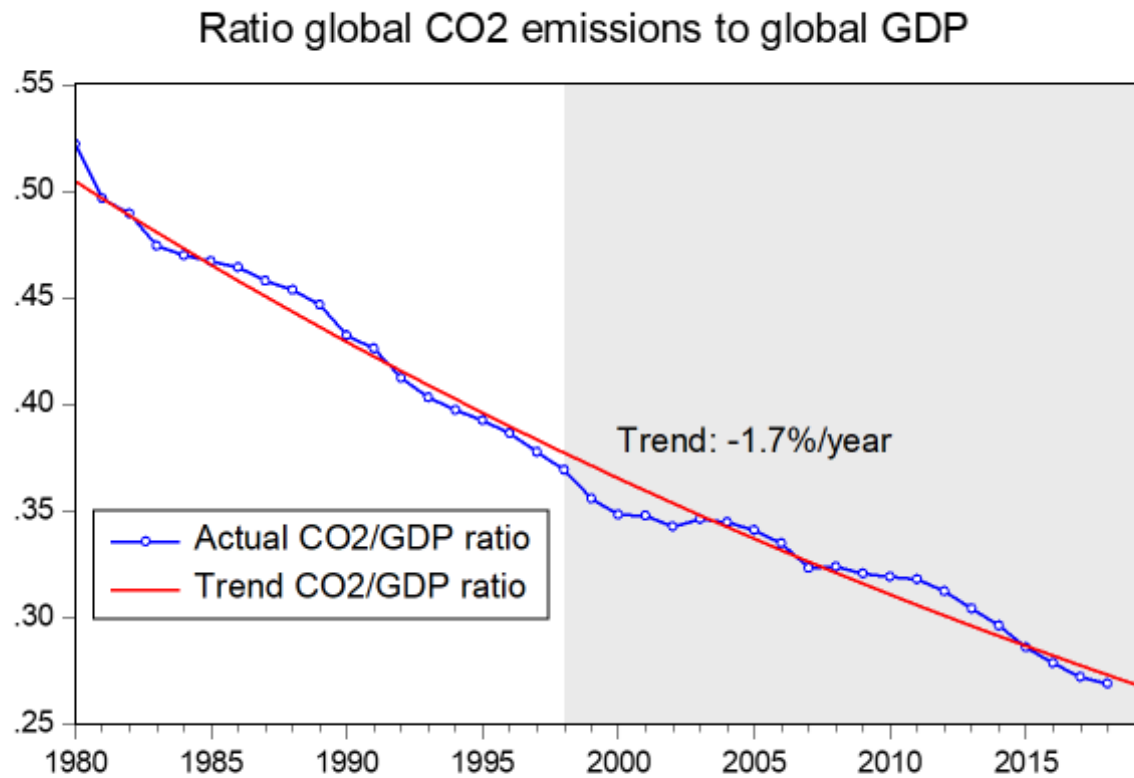
CLIMATE

Global CO₂ emissions: 1900 - 2018



4

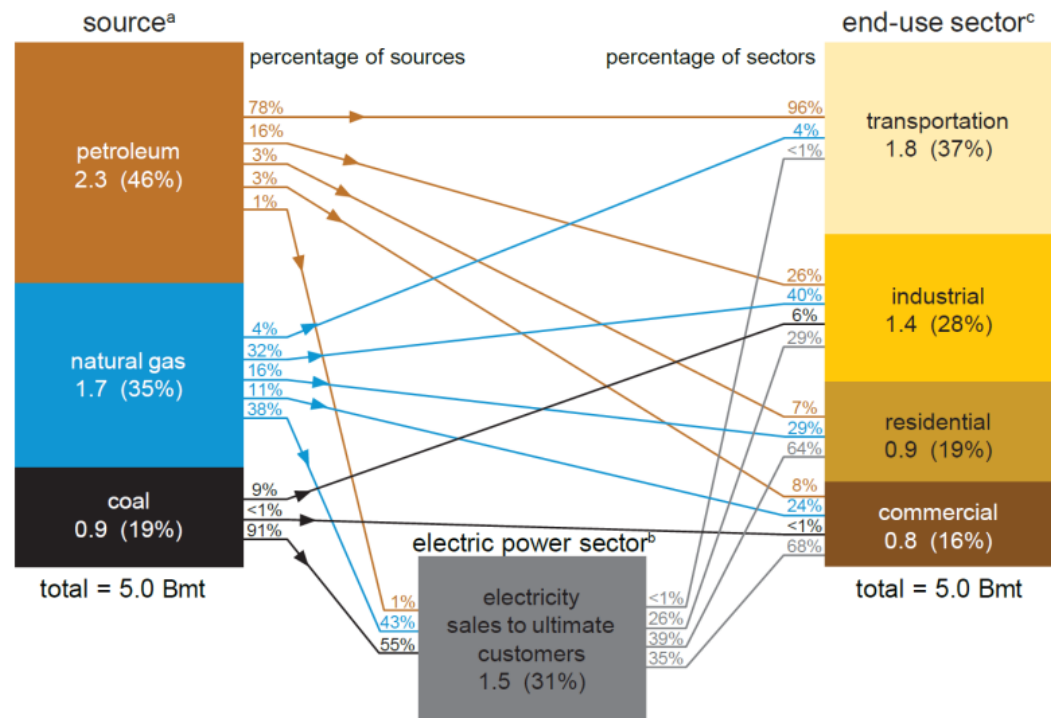
CLIMATE



CLIMATE

U.S. CO₂ emissions from energy consumption by source and sector, 2022

billion metric tons (Bmt) of carbon dioxide (CO₂)



CLIMATE

EDITORS' PICK

What Will An American Carbon Tax Cost You?

Ed Hirs Contributor 

Follow

Jul 21, 2020, 09:28am EDT

Cost of Carbon—The Consumer Version

Let's calculate the cost of carbon for everyday activities so that you can look at your bills and estimate what the added expense of a carbon tax will be. Again, at 4.54 pennies per pound, the consumer will face the following carbon taxes for transportation and home heating—with heat [content](#) noted—

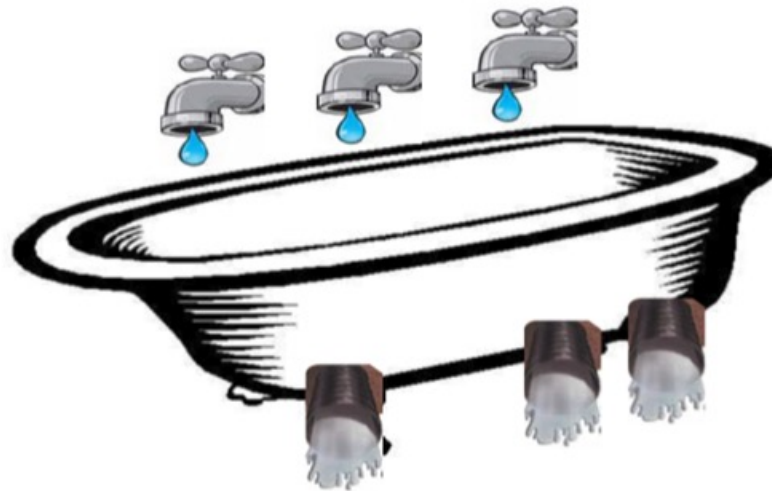
	<u>Pounds CO₂ emitted</u>	<u>Carbon Tax</u>	<u>Btu</u>
1 gallon gasoline:	19.6	\$0.89	120,286
1 gallon heating oil:	22.4	\$1.02	137,381
1,000 cubic feet natural gas:	117.1	\$5.31	1,037,000

Consumer Carbon Tax HIRS

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	<u>Pounds CO₂ per 2,000 kWh</u>	<u>Carbon Tax</u>
Coal	4,420	\$200.49
Natural gas	1,840	\$83.46
Wind, Solar, Nuclear	0	\$0.00

WORLD CRUDE MARKET



This is not a bathtub.

William Nordhaus

Figure 1. The World Oil Market à la Magritte

WORLD CRUDE MARKET

- Global post-pandemic oil market: ~100 million bbls per day (bopd)
- US market:
 - Consumption: 18 to 20 million bopd
 - Production: 13 million bopd
- Russian market:
 - Production: Was 10.5 million bopd, now 9.5 million bopd
 - Exports: Were 7 million bopd, now ??
- China requires 10 million bopd

VALUATION RISKS

- Ownership of assets
- Security of feedstocks
- Security of offtake
- Proper payments of Royalties
- Derivatives
- Counterparty risks
- Environmental
- Sovereign risks

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On Wall Street and in the oil patch, Ken Lay's Enron Corp. has been a smashing success. Here are some things that could go wrong.

Hidden risks

By Toni Mack



Enron Corp. Chairman Kenneth Lay
Aggressive people, aggressive accounting.

WORLD CRUDE MARKET

- SPR releases ended. China has stopped buying. OPEC+ quota cut.
- Middle East rig count 25% lower than pre-pandemic levels
- LNG fundamentals back to “normal” after a whipsaw 2022
- U.S. natural gas

- ▶ Vertically integrated—generation to meter
- ▶ Restructured markets
 - ▶ Generators
 - ▶ Transmission
 - ▶ Local Distribution Company
 - ▶ Retail Electricity Provider

CONTRASTING ELECTRICITY MARKETS

▶ Vertically integrated—generation to meter

▶ Restructured markets

▶ Generators

▶ Transmission

▶ Local Distribution Company

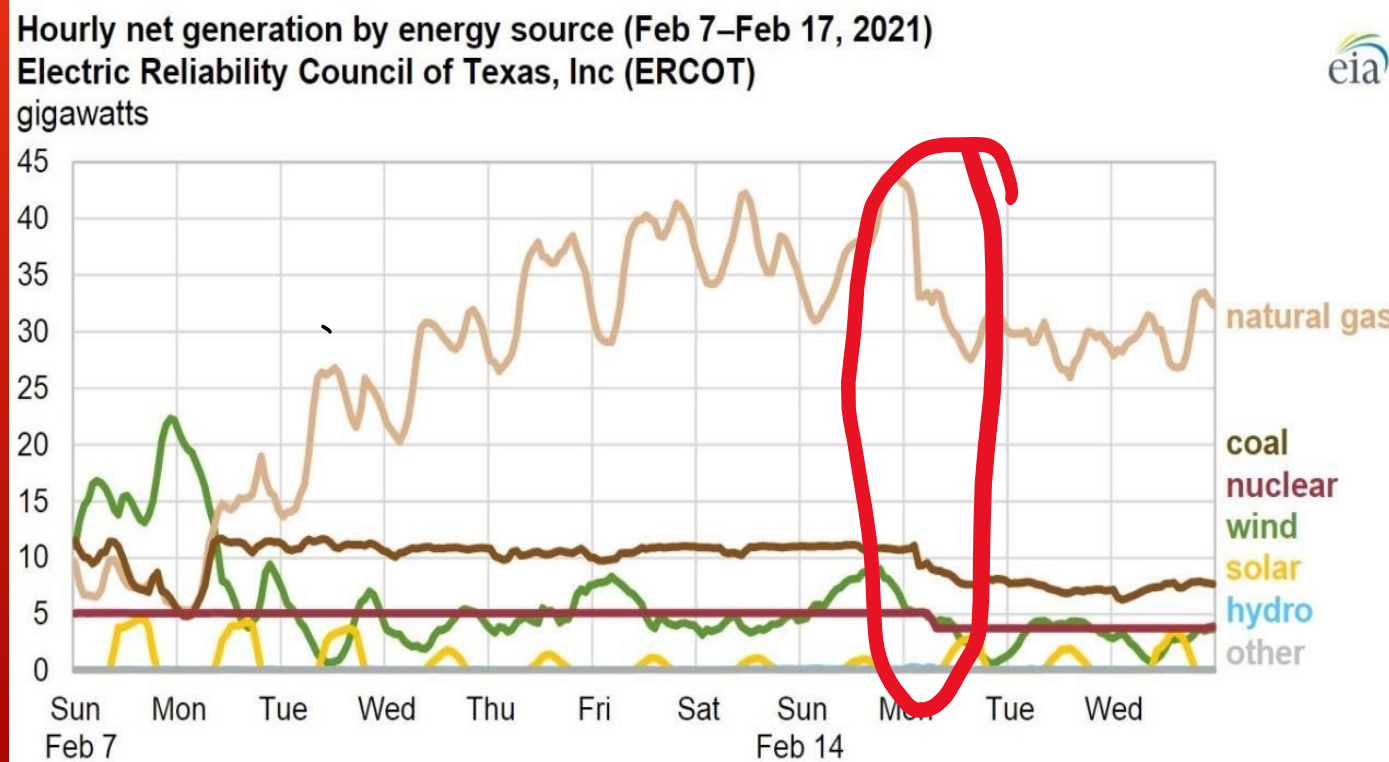
▶ Retail Electricity Provider

TRADERS

A hand-drawn diagram in white on a red background. The word 'TRADERS' is written in a stylized, handwritten font. Two arrows originate from the word: one points left towards the 'Generators' entry, and the other points down and left towards the 'Local Distribution Company' entry. The list of market components is separated by dashed lines.

CONTRASTING MARKETS

WHAT HAPPENED IN ERCOT?



FERC/NERC Staff Report on the 2011 Southwest Cold Weather Event

While the probability of a winter event in the predominantly summer peaking Southwest appears to be low, shedding load in the winter places lives and property at risk. The task force recommends that all entities responsible for the reliability of the bulk power system in the Southwest prepare for the winter season with the same sense of urgency and priority as they prepare for the summer peak season.

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TEXAS WAS WARNED IN 2011

ER Ø OT

ERCOT

OPINION // OUTLOOK

Texas suffers from Soviet-style electricity distribution system

Edward A. Hirs III and Paul W. MacAvoy

Feb. 22, 2013 | Updated: Feb. 22, 2013 7:45 p.m.

Is the [Electricity Reliability Council of Texas](#) repeating the central planning failures of the late Soviet Union?

ERCOT

Electricity Only

ERCOT MARKET CHARACTERISTICS

- ▶ For 8 of the 10 years prior to 2021, for the generators, $P < ATC$
- ▶ WSJ: Texans paid \$28 billion more than they would have in old-style regulated electric utility market

ERCOT MARKET CHARACTERISTICS

- ▶ From 2010 to 2021, the Texas economy grew from \$1.25 trillion to \$1.99 trillion
- ▶ From 2010 to 2021, the ERCOT fleet of dispatchable generation shrank

TEXAS ECONOMY & ERCOT

- ▶ Nash (*A Beautiful Mind*) oligopoly behavior
- ▶ Commodities traders
- ▶ LMP is Nuts—short-term price “signals” do not encourage long-term investment

ERCOT MARKET INCENTIVES

- ▶ Texas

- ▶ Demand growth

- ▶ California

- ▶ Generation—too rapid retirements
 - ▶ Transmission— $EVA < 0$

BROKEN GRIDS

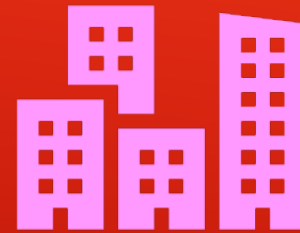
- ▶ Restricted entry
- ▶ Restricted information
- ▶ Pricing controlled by ERCOT
- ▶ Monopsonist facing generators
- ▶ Monopolist facing consumers
- ▶ Characterized by price manipulation
- ▶ Lack of accountability
- ▶ State mandated bailout—\$3+ billion

ERCOT MARKET CHARACTERISTICS

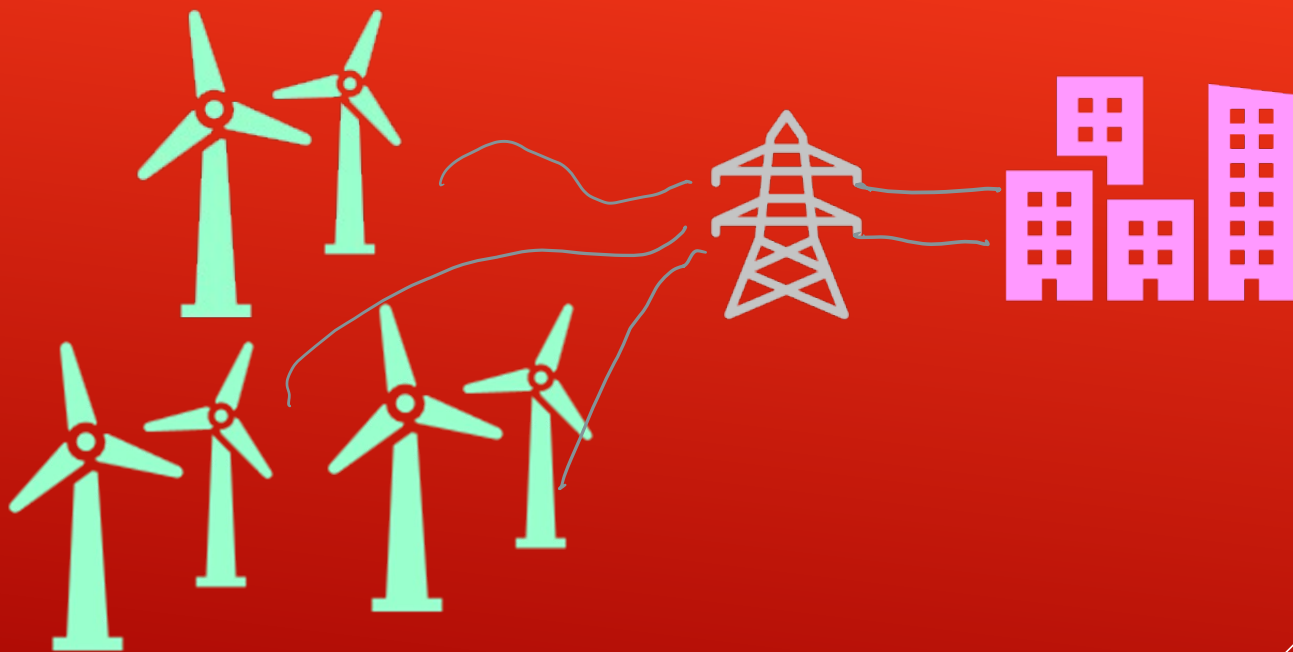
- ▶ Changing portfolio
- ▶ Capital investment
 - ▶ Generation
 - ▶ Transmission
 - ▶ Local Distribution Company
 - ▶ Retail Electricity Provider

ERCOT MARKET CHARACTERISTICS

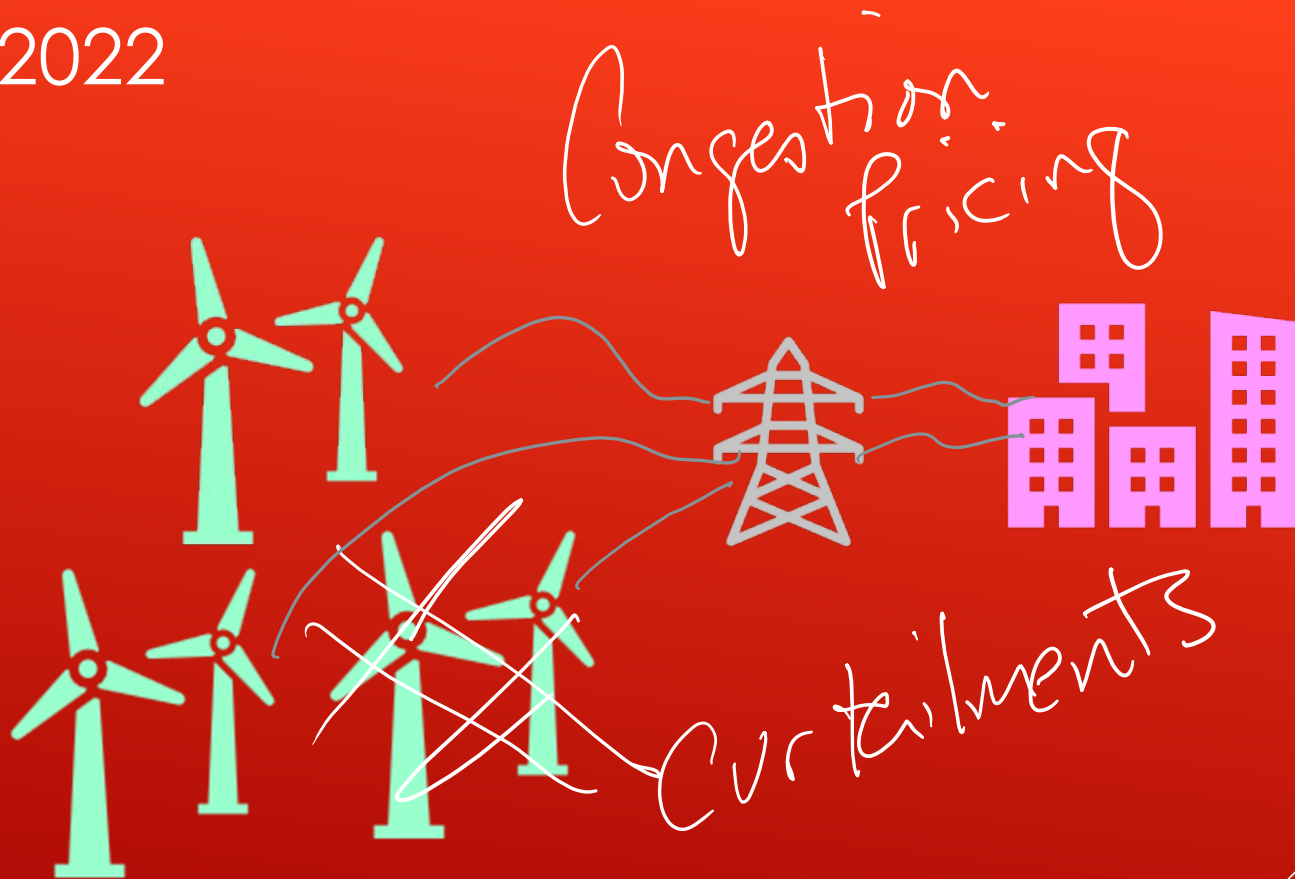
TEXAS 2009



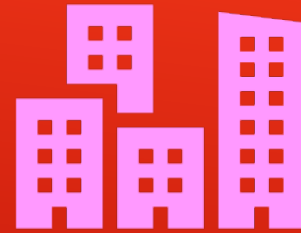
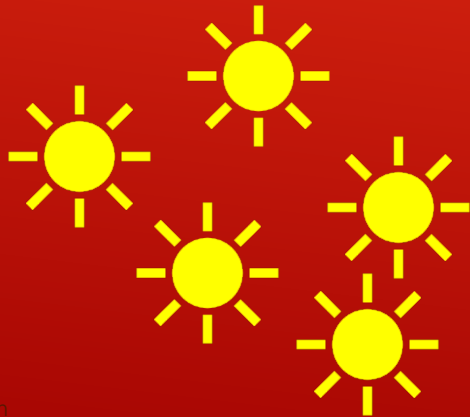
TEXAS 2022



TEXAS 2022



TEXAS 2026—AND EVERYONE ELSE TOO



- ▶ Commodities exchanges
- ▶ Renewable energy developers
- ▶ Backup generator suppliers
- ▶ Virtual power companies
- ▶ Cryptocurrency miners

BEDFELLOWS

- ▶ California—5 GW of new gas power plants; AZ's electricity
- ▶ Texas—10 GW of new gas power plants; charge renewables for transmission; re-integration of generators with REPs; limits on renewables

SHORT TERM SOLUTIONS

Not crypto!

BARRON'S

ECONOMY & POLICY

Who's Winning Texas' Bet on Crypto?

COMMENTARY By Ed Hirs Sept. 29, 2022 4:00 am ET

Cryptocurrency miners have pending applications with ERCOT that will require 33 gigawatts of electricity. ERCOT's peak electricity demand reached nearly 80 gigawatts this summer. As the cryptocurrency miners require more and more electricity, they will drive up the price of electricity for 26 million Texans and destabilize the grid. But, and here is the beauty of their scheme, the cryptocurrency miners will rescue the grid by selling back their electricity at a major markup. Texas consumers will pay and pay again. As the scheme progresses, cryptocurrency miners will become **tapeworms** on the ERCOT grid.

SHORT TERM SOLUTIONS

The New York Times

<https://www.nytimes.com/2023/04/09/business/bitcoin-mining-electricity-pollution.html>

The Real-World Costs of the Digital Race for Bitcoin

Bitcoin mines cash in on electricity — by devouring it, selling it, even turning it off — and they cause immense pollution. In many cases, the public pays a price.

- ▶ ERCOT Roulette continues for four years
- ▶ Renewable electricity generation will be overbuilt
- ▶ Batteries can help but require high prices
- ▶ Proposed solutions

ERCOT MARKET

VALUATION RISKS

- Ownership of assets
- Security of feedstocks
- Security of offtake
- Proper payments of Royalties
- Derivatives
- Counterparty risks
- Environmental
- Sovereign risks

MIXED VALUATION CONCERNS

- Land—ranching and farming
- Minerals—primacy usually
- Surface rights—solar and wind
- Pore space—CO₂ landfill
- Mixed terms
- Rights of way
- Sovereign risk

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