Without Bold Action, Electricity Insecurity Will Imperil the Texas Growth Story

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Key Themes

• Texas is by far and away the largest and fastest-growing U.S. electricity producer and user, generating about 1.5 times as much electricity as the UK did in 2020.

• Texas capacity growth increasingly favors intermittent sources

• The rest of growth is from gas—which power plants must source from offsite and which also fuels homes AND the home standby generators that consumers are buying to compensate for grid unreliability

• GRID RELIABILITY IS ESSENTIAL FOR INDUSTRIAL COMPETITIVENESS AND GROWTH TO 2050 AND BEYOND

• Gas + Power becoming an energy security Gordian knot in TX

• Big challenges loom, esp. if transport electrification takes off

• But we have massive opportunities ahead too
  • Power export opportunities from greater interconnection with neighboring grids (after capacity buildout over time in response to comparative advantage)
Big Texas Growth
The 4 State "Horsemen" of U.S. Electricity Demand

How does this curve evolve if we move toward 50 million Texans by 2060-2070?
Texas Is #1 U.S. Demand Electricity Driver

Golden + Lone Star States = ~17% of US National Electricity Production

Electricity Sales
2010 to 2020 Change, MWh
- Red: -23,250,534 to -11,648,888
- Orange: -11,648,888 to -5,146,493
- Light Orange: -5,146,493 to 1,141,372
- Yellow: 1,141,372 to 8,688,090
- Green: 8,688,090 to 50,909,194

Graph showing Total Power Production, MWh and California % of US Total, Texas % of US Total.
Blackouts
The Outcome We Should Strive to Avoid

Author’s driveway during Great Texas Blackout, February 2021, Houston, TX
February Troubles

February 2011, ERCOT Generation, 15-min Intervals, MWh

- Coal
- Gas
- Gas_CC
- Hydro
- Nuclear
- Other
- Wind

February 2021, Same

- Biomass
- Coal
- Gas
- Gas_CC
- Hydro
- Nuclear
- Other
- Solar
- Wind

Source: ERCOT, Author’s Analysis
Major Load Growth Without Commensurate Baseload Gen Expansion

ERCOT Hourly Load, MW (2002-July 2021)

Texas Generation Capacity, MW (Operating – Retirements)

Source: ERCOT

Source: EPA, Author’s Analysis
TX Power Generation: Massive Scale, Increasingly Intermittent

Power Plants Opened in Texas by Size of Plant, Year Opened and Fuel

Megawatts

- Natural Gas
- Coal/Lignite
- Nuclear

How does this change if Texas begins more explicitly pricing in reliability?
Texas Gordian Knot of Gas + A Couple Ideas to Firm Up Power Supplies & Create Investment Opportunities
Generator Sales Reflect Consumers’ Growing Belief In Grid Unreliability

- “What we're finding is that the person who buys a home standby generator is worried about long duration outages.”—Aaron Jagdfeld, CEO, Generac, 2Q2021 Earnings Call

- Generac believes only about 3% of homes in Texas currently have a standby generator, so lots of sales upside.

- But what about those who cannot afford $10,000 or higher outlays for a home standby generator?

Inter-Grid Stress Transfer: Self-sourcing driven by power grid unreliability places more pressure on gas grid. 50,000 X 24 kW home standby generators (i.e. 1GW delivered) can use 0.36 BCF/day of gas. A kWh of power from an HSB likely consumes 1.3 to 2 times the gas used by a utility-scale grid-connected plant per kWh.
Texas & TVA: “Crisis/Price-Driven Grid” vs. “Reliability Grid”

Texas Power Generation by Fuel, 1990-2019 (MWh)

TVA Power Generation by Fuel, 2003-2020 (MWh)

Source: EIA

Source: TVA
Could a nuclear renaissance help cut the Gordian knot increasingly tying power and gas security together?

South Texas Project: 12,200 acre site
Export Opportunities Through More Interconnections?

Blue Bell Creameries

We eat all we can, and we sell the rest.
Mother Nature Will Test the TX Grid Many More Times...And Potentially in Harsher Fashion
It Can Get Much Colder Than It Did in Feb. 2021

ERCOT has initiated controlled outages four times:
--22 December 1989 (500 MW)
--17 April 2006 (1,000 MW)
--2 February 2011 (4,000 MW), and
--15-18 February 2021 (20,000 MW). Three of these were extreme temperature events.

The Worst Texas Power Crises Aren’t From Hurricanes, But Instead Driven By Extreme Temps
Thank You!

Questions? Drop a line to gbc3@rice.edu