The Shifting Finance of Electricity Generation

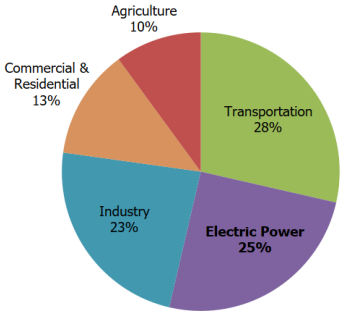
34th Mitsui Finance Symposium: Venture Capital and Private Equity

Kunal Sachdeva

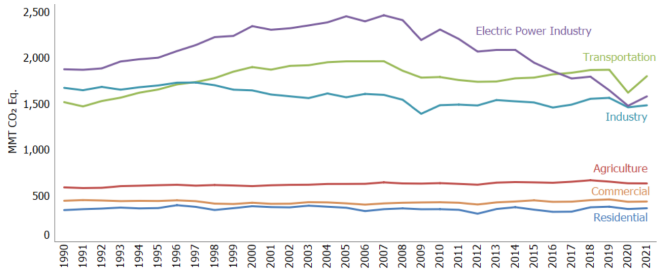
June 10th, 2023

Electric Power Generation is a Dominant Source of GHG Emissions

Makes up a quarter of GHG emissions in the United States



U.S. Environmental Protection Agency (2023). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021



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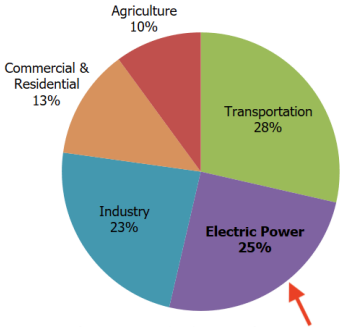

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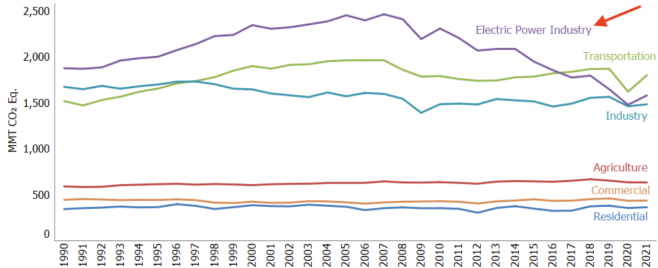

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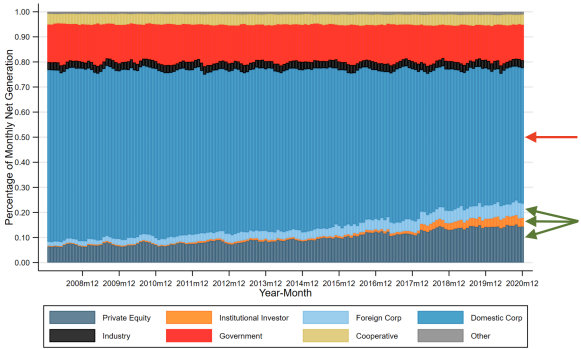
Clear Transition Around the Change of Energy Production

How Does Finance Matter?

What Is the Role of Finance in the Composition of Energy Production?



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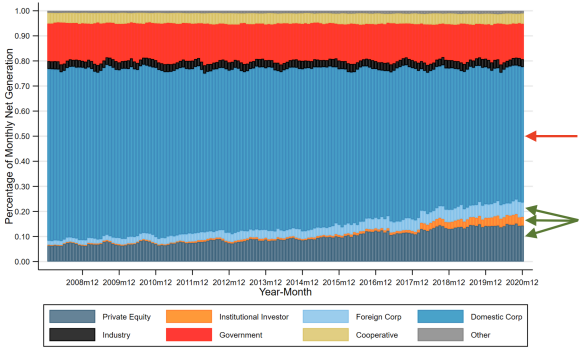
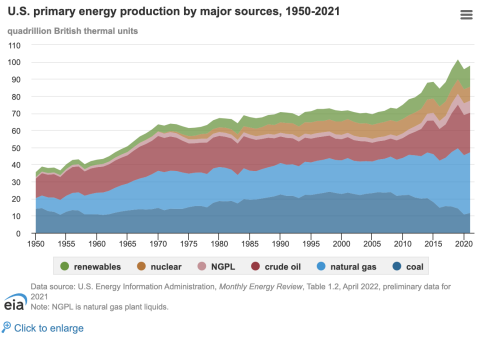
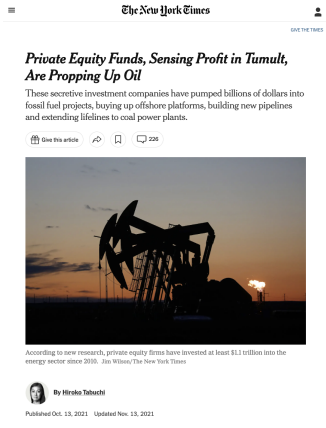




Creation and Destruction in the Energy Sector

Anecdotal Evidence of a Reallocation of Older Power Plants

Sale of fossil fuel plants from domestic corporations to new owners?



The New York Times

GIVE THE TIMES

Private Equity Funds, Sensing Profit in Tumult, Are Propping Up Oil

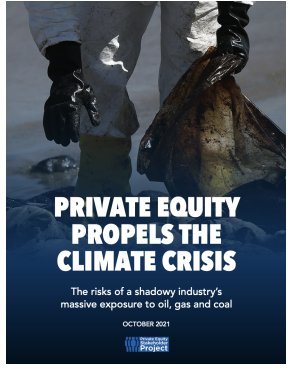
These secretive investment companies have pumped billions of dollars into fossil fuel projects, buying up offshore platforms, building new pipelines and extending lifelines to coal power plants.

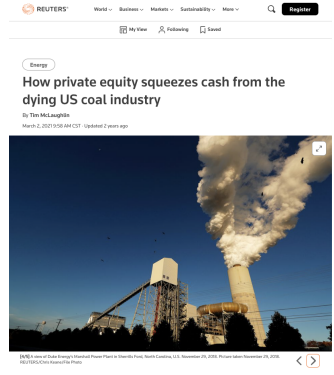
Give this article · 226

According to new research, private equity firms have invested at least $1.1 trillion into the energy sector since 2010. Jim Wilson/The New York Times

By Hiroko Tabuchi

Published Oct. 13, 2021 Updated Nov. 13, 2021





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Energy

How private equity squeezes cash from the dying US coal industry

By Tim McLaughlin

March 2, 2021 9:58 AM CST · Updated 2 years ago

[4/5] A view of Duke Energy's Marshall Power Plant in Sherrills Ford, North Carolina, U.S. November 29, 2018. Picture taken November 29, 2018. REUTERS/Chris Keane/File Photo

Creation and Destruction in the Energy Sector

Anecdotal Evidence of a Private Equity Investing in Green Assets

In contrast, money seems to be flowing to renewable PE funds

Bloomberg

Green | Finance

Private Equity Follows the Money—and the Money Is Ditching Fossil Fuels

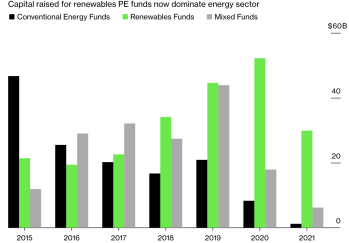
Funds dedicated to renewable energy have lapped fossil fuel funds 25 times over.

Private equity investors are pouring capital into fast-growing sectors such as solar energy. *Photographer: Jeremy Suarez/Bloomberg*

By Benjamin Robertson and Melissa Karsh
July 6, 2021 at 5:00 AM CDT *Updated on July 7, 2021 at 2:27 PM CDT*

Private Equity Going Green

Capital raised for renewables PE funds now dominate energy sector



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December 01, 2022 06:19 PM

Solar energy attracting more institutional investors

By HAZEL BRADFORD

TWEET SHARE SHARE EMAIL REPRINTS

Summary of Key Results

How has finance and competition shaped energy production in the United States?

1. **Who Owns Power Generation in the United States?**
   - → Domestic listed corporations have reduced their ownership from 69% to 54% of total generation
   - → Private equity, institutional investors, and foreign corporations have increased their ownership from 8% to 24%
   - → Together they own 59% of wind, 44% of solar, and 28% of natural gas capacity

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4. **Are there Differences in Pricing and Contract Terms?**
   - → Private equity sell under contracts with shorter duration,
   - → Further, they have shorter increment pricing, and more peak-term periods

Perspective on the Paper

Why Does This Paper Matter?

How Finance Matter for Energy Markets:

1. Transition in Energy Production
   - → Any path to a net-zero includes a significant change in energy production
   - → Provide a comprehensive study of the market

2. Leakage Hypothesis
   - → Provides new empirical facts on the hypothesis
   - → Help inform policymakers and stakeholders alike on the nature of energy transition

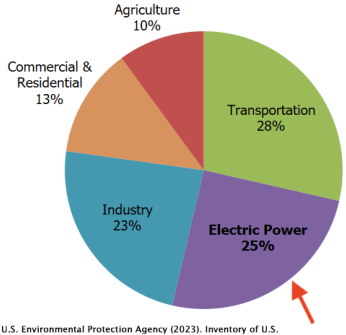
3. Effects of Deregulated of Energy Markets
   - → Exit of domestic firms, private equity initiate greenfield investments
   - → Private equity have higher average price, operate at lower capacity

>> ***Focus on what the paper can tell us (and hasn't yet)!***

Comment 1 – Electricity Generation Ownership ≠ GHG Emissions

Positive relation between ownership and production

Floating in the background is the relation between energy production and its relation to GHG emissions



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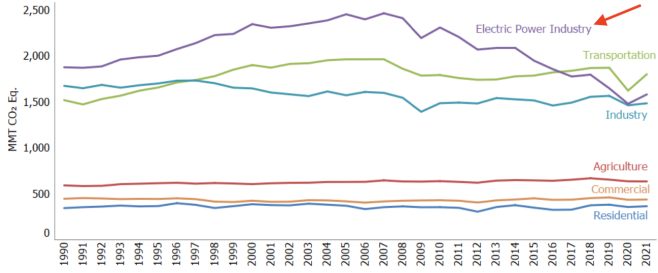

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Comment 1: Electricity Generation Ownership ≠ GHG Emissions

Fact 1 – Domestic Firms Own Fewer Natural Gas Plans

- Private equity has increased its share of electricity generation in natural gas, relative to domestic corporations

Fact 2 – Domestic Firms Operate More Intensely and Less Efficiently

- Domestic corporations operate at a higher capacity (intensity), and higher heat rate (less-efficiency)
  - → Subsample tests show that capacity is driven by natural gas in non-ISO/Retail Choice markets
  - → Subsample tests show heat rate also driven by natural gas, not related to non-ISO/Retail Choice markets

Fact 3 – Private Equity Offer Peak Supply

- Private equity offers shorter contracts, smaller price increments, and focus on peak period terms
- Suggestive that they provide on-demand energy during peak periods
- Likely from less green sources (solar/wind) vs. coal and natural gas plants.

>> ***While owning 'greenfield' investments at a higher rate, are they polluting less within a fuel group?***

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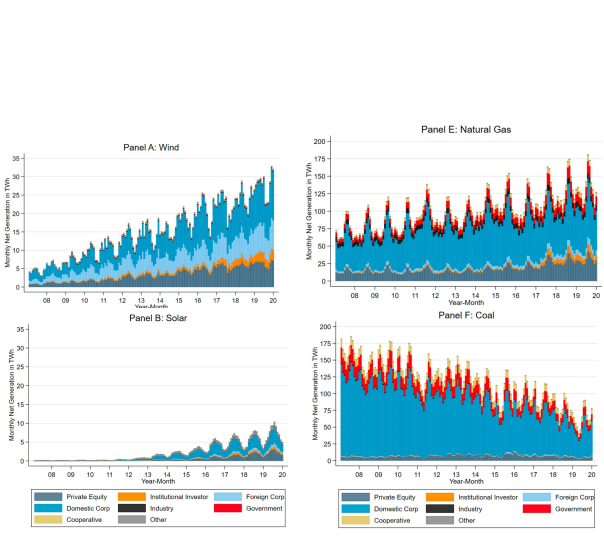

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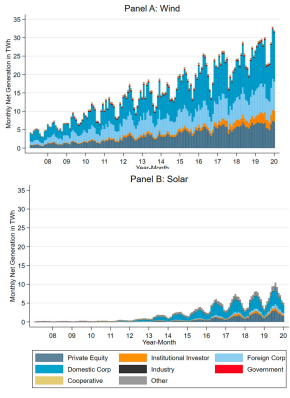

Retired Coal Units[2]

	Location	Units	Total capacity (megawatts)	Actual retirement date
Edwardsport Station	Ind.	6, 7, 8	160	2010
Cliffside Steam Station	N.C.	1, 2, 3, 4	198	2011
Buck Steam Station	N.C.	3, 4	113	2011
W.H. Weatherspoon Plant	N.C.	1, 2, 3	170	2011
Gallagher Station	Ind.	1, 3	280	2012
Cape Fear Plant	N.C.	5, 6	316	2012
Beckjord Station	Ohio	1	94	2012
Dan River Steam Station	N.C.	1, 2, 3	276	2012
H.F. Lee Plant	N.C.	1, 2, 3	382	2012
Robinson Plant	S.C.	1	177	2012
Buck Steam Station	N.C.	5, 6	256	2013
Riverbend Steam Station	N.C.	4, 5, 6, 7	454	2013
Sutton Plant	N.C.	1, 2, 3	553	2013
Beckjord Station	Ohio	2, 3	222	2013
Beckjord Station	Ohio	4, 5, 6	543	2014
W.S. Lee Steam Station	S.C.	1, 2	200	2014
W.S. Lee Steam Station	S.C.	3	170	2015 Converted to natural gas
Miami Fort Station	Ohio	6	163	2015
Wabash River Station	Ind.	2, 3, 4, 5, 6	668	2016
Crystal River Energy Complex	Fla.	1, 2	766	2018
Asheville Plant	N.C.	1, 2	378	2020
Total		51	6,539	

Planned Coal Unit Retirements

	Location	Units	Total capacity (megawatts)	Planned retirement date
Gallagher Station	Ind.	2, 4	280	2022[1]
Allen Steam Station	N.C.	1, 2, 3	582	2024
Total		5	862	

Coal Units with Proposed Accelerated Depreciation

	Location	Units	Total capacity (megawatts)	Potential retirement date
Allen Steam Station	N.C.	4, 5	516	2024[2]
Rogers Energy Complex (Cliffside Steam Station)[3]	N.C.	5	544	2026[2]
Gibson Station	Ind.	5	310 Duke Energy's ownership share	2026[2]
Cayuga Station	Ind.	1, 2	995	2028[2]
Marshall Steam Station[3]	N.C.	1, 2	740	2028[4]
Mayo Plant	N.C.	1	727	2029[2]
Roxboro Steam Plant	N.C.	3, 4	1,392	2029[2]
Gibson Station	Ind.	3, 4	1,252	2034[2]
Gibson Station	Ind.	1, 2	1,260	2038[2]
Total		15	7,736	

Coal Unit Retirement Dates from Integrated Resource Plans

	Location	Units	Total capacity (megawatts)	Potential retirement date
Roxboro Steam Plant	N.C.	1, 2	1,047	2028
Marshall Steam Station[3]	N.C.	3, 4	1,318	2034
Belews Creek Steam Station[3]	N.C.	1, 2	2,220	2037
Rogers Energy Complex (Cliffside Steam Station)[3]	N.C.	6	844	2048
Total		7	5,429	

1 In addition to coal unit retirements, a number of older oil/natural gas generation units have been or will be retired.
2 In rate cases filed in 2019, the company has proposed shortening the depreciable lives of coal units as it transitions to cleaner energy sources. These depreciation dates have not been approved yet by state regulatory commissions.
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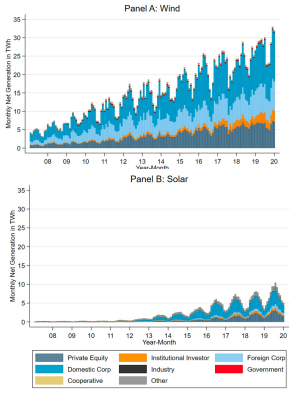

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Can the paper clearly link the percentage of GHG emissions by capital providers?

Suggestion 1: Link to the TRI Pollution Data to Study Relative GHG Emissions

- Do Private Equity, Foreign Corporations, and Institutional Investors' plants produce less pollution, for the same type of plant, versus domestic firms?

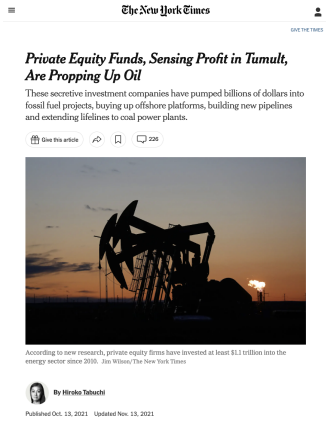
Suggestion 2: Subset the analysis to those that are transferred/sold, consider narratives

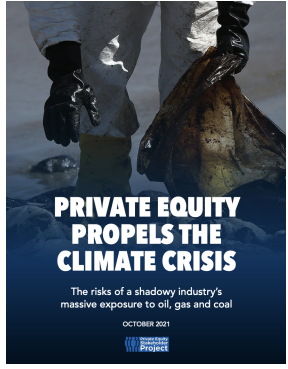
- Conditional on a private equity firm purchasing plants, they are running it more efficiently/less pollutive?

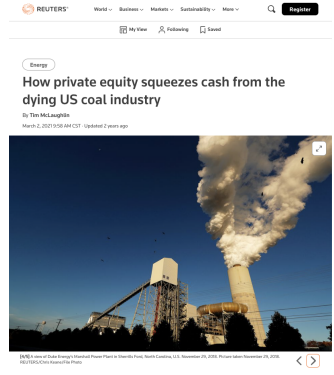
Comment 2 – Testing the Leakage Hypothesis

Can the paper better test the leakage hypothesis?

Sale of fossil fuel plants from domestic corporations to new owners?







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Can the paper better test the leakage hypothesis?

The paper suggests there is limited evidence against the leakage hypothesis

- **Fact 1** – Domestic corporations are less likely to continue operating older power plants and less likely to sell older power plants to other owners, such as private equity, institutional investors, or foreign corporations.
- **Fact 2** – Domestic publicly listed corporations are not more likely to sell fossil fuel power plants to other owners.
- **Fact 3** – Domestic publicly listed corporations are not more likely to sell power plants located in states where the population has high climate concern
- **Fact 4** – Evidence that foreign corporations don't decommission coal and petroleum power plants (in favor of hypothesis)

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Let's discuss each of these and their relationship to the hypothesis

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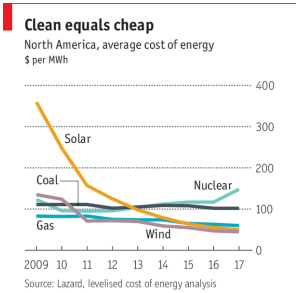

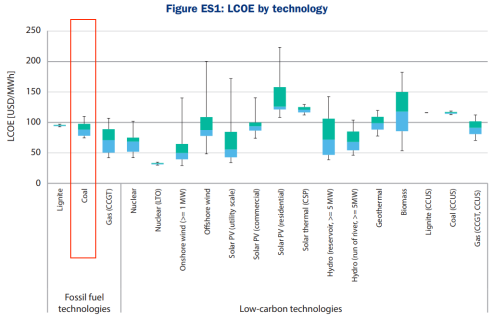

Note: Values at 7% discount rate. Box plots indicate maximum, median and minimum values. The boxes indicate the central 50% of values, i.e. the second and the third quartile.

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- **Fact 3** – Domestic publicly listed corporations are not more likely to sell power plants located in states where the population has high climate concern
  - → This piece of evidence can go both ways. Not selling in a high climate concern area means (i) you are not divesting from high carbon plants (good?) (ii) you likely not responsive to local stakeholders (bad?)

- **Fact 4** – Slight evidence that foreign corporations don't decommission coal and petroleum power plants
  - → I think this only matters only if the power plants were coming from sales by domestic corporations.

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These seem supportive but does not pin-down the truth if the leakage hypothesis doesn't exist.

Comment 2 – Testing the Leakage Hypothesis

What would an ideal test of the leakage hypothesis look like?

Take a step back, what would an ideal test of the leakage hypothesis look like?

1. Who is selling to whom (not just DLC)?

→ Possible that private equity firms are owning more greenfield power plants (new plants), yet are also selling some to domestic corporations

- Would suggest that without PE investment, their ownership share would have been even that smaller
- This would be evidence, in part, ***against*** a leakage hypothesis

Transaction Name	Acquiree Name	Acquirer Name	Announced Date
Gulf Power acquired by Nextera Energy	Gulf Power	Nextera Energy	May 21, 2018
Smart Energy Capital acquired by Nextera Energy	Smart Energy Capital	Nextera Energy	May 2013
Florida City Gas acquired by Nextera Energy	Florida City Gas	Nextera Energy	May 21, 2018
Oncor Electric Delivery Company acquired by N...	Oncor Electric Delivery Company	Nextera Energy	Aug 1, 2016
WindLogics acquired by Nextera Energy	WindLogics	Nextera Energy	Sep 1, 2006

Comment 2 – Testing the Leakage Hypothesis

What would an ideal test of the leakage hypothesis look like?

2. How do domestic listed corporations operate existing plants differently? How about buyers?

- Are they shutting down inefficient plants faster? (likely would need to add GHG data)
  - → Interesting to see the hazard rate in relation to the environmental impact of the plant
- Are they investing/retrofitting them more/less than private equity firms? (EPA P2 data, or EIA data on capex)
  - → Again, this would be evidence, in part, ***against*** a leakage hypothesis
- Conditional on being sold and used in a more intense or less efficient way?

Many of these tests could directly test the leakage hypothesis, likely more complex narrative

Comment 3 – Are Consumers Better Off?

And if so, which consumers?

Growing literature studying the impact of private equity ownership:

- **Performance, productivity, employment, and profitability** – Davis et al., 2014; Bernstein and Sheen, 2016; Antoni, Maug and Obernberger, 2019; Davis et al., 2021...
- **Workplace safety, employees health, and employee satisfaction** – Cohn, Nestoriak and Wardlaw, 2019; Lambert, Moreno, Phalippou, and Scivoletto, 2021 ...
- **Environment and pollution** – Shive and Forster, 2020; Bellon, 2022 ...
- **Customers in regulated industries** – Eaton, Howell and Yannelis, 2020 ...
- **Hotel Industry** – Spaenjers and Steiner, 2023, ...
- **(many others)** ...

What does the evidence say about the increased ownership and generation by private equity?

Comment 3 – Are Consumers Better Off?

And if so, which consumers?

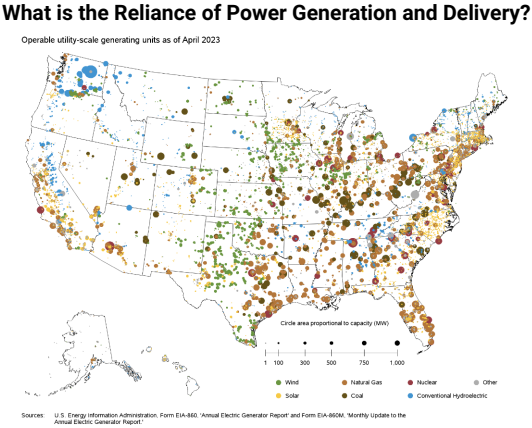
What does the evidence say about the increased ownership and generation by private equity?

1. The average costs charged by private equity are greater than other owners (bad?)
2. Private equity operates more at a lower heat rate (good?)
3. Private equity sold under contracts with shorter duration (mix?)

How do we think about this from a consumer's perspective? What margins are we missing?

Comment 3 – Are Consumers Better Off?

Are New Plans Providing Beneficial Diverse Set of Electricity



Comment 3 – Are Consumers Better Off?

Are New Plans Providing Beneficial Diverse Set of Electricity

What is the Reliance of Power Generation and Delivery?

Does the increase in private equity investments in power generation lead to greater/worse outcomes

Comment 3 – Are Consumers Better Off?

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ENERGY

Texas ice storm leaves hundreds of thousands without power

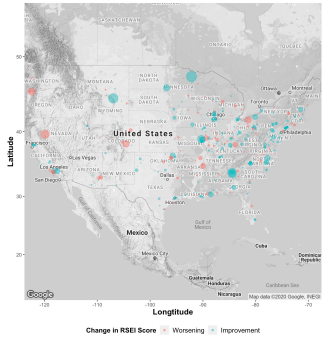
Updated February 3, 2023 - 4:54 AM ET

By Giulia Heyward

Comment 3 – Are Consumers Better Off?

Are New Plans Providing Beneficial Diverse Set of Electricity

- **Suggestion 2 – What happens to the GHG Emissions in Local Economies**
  - → What is the association of private equity to emissions in local regions?



Excited for this paper!

Important contribution sorting out facts about U.S. electricity generation

- Paper is interesting, comprehensive, important, carefully executed
- First order question – understanding the changing landscape of energy production, especially against the backdrop of net-zero emission targets
- Leakage Hypothesis – provides new evidence in the debate around how domestic listed firms respond
- Raises new and exciting questions about the positive (and negative) externalities to finance – clearly matters!