

The Impacts of Renewables and Energy Storage in Texas

Joshua Rhodes, PhD
January 2023

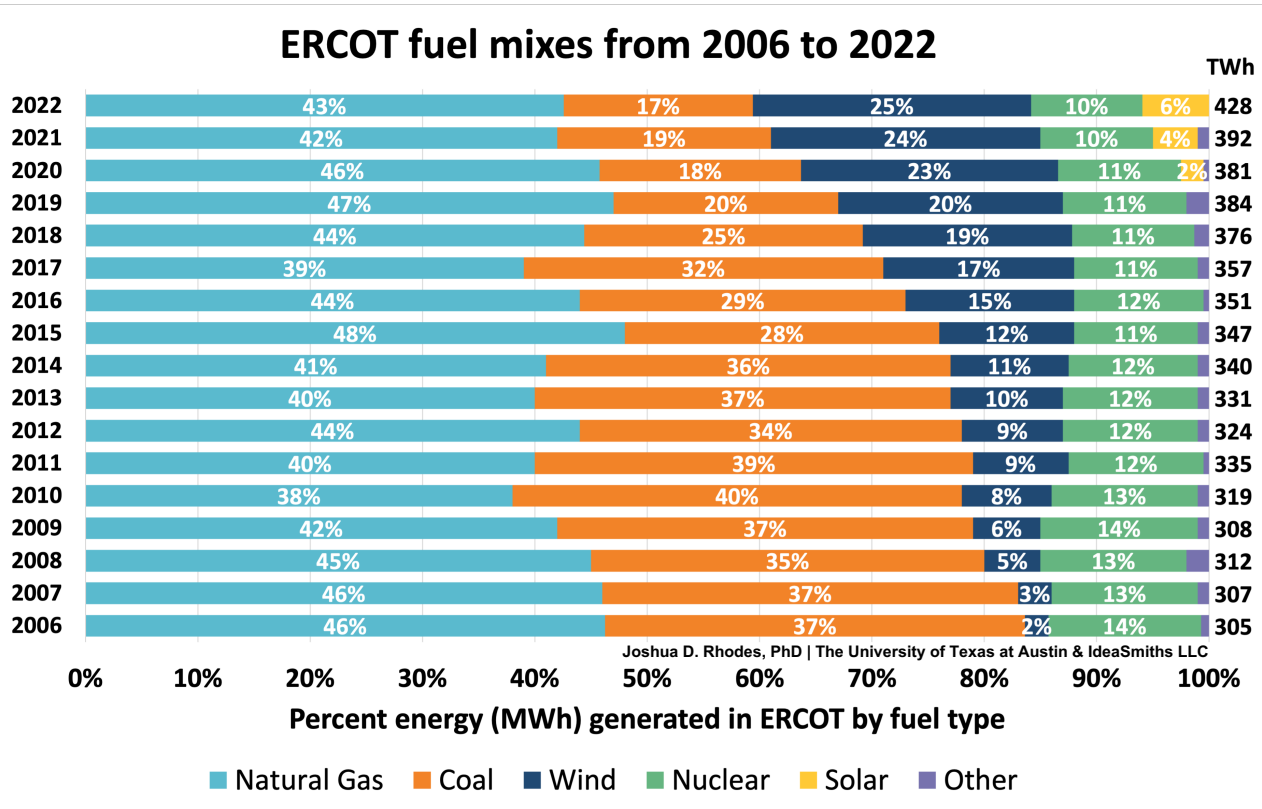




IdeaSmiths LLC is a consulting firm that specializes in energy systems analysis and the evaluation of novel energy technologies.



Renewables have been growing in Texas/ERCOT as a major source of electricity



~15%
more from
small-
scale solar



This presentation is based on two recent consulting reports on renewables in Texas

https://www.idea-smiths.net/wp-content/uploads/2022/10/IdeaSmiths_CET ERCOT_RE_FINAL.pdf

The Impact of Renewables in ERCOT

By Joshua D. Rhodes, PhD
October 2022



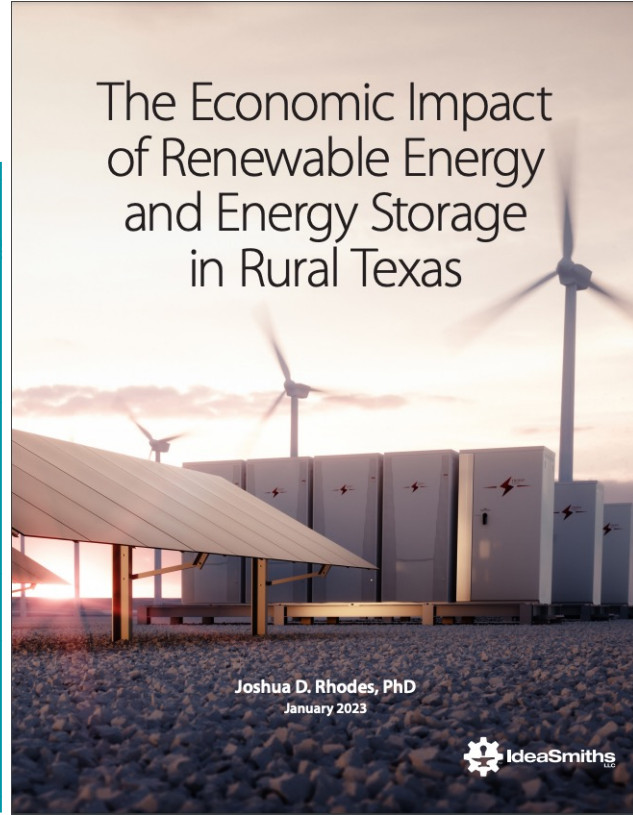
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https://www.idea-smiths.net/wp-content/uploads/2023/01/EconomicImpactofRenewable-Energy_JAN2023.pdf

The Economic Impact of Renewable Energy and Energy Storage in Rural Texas



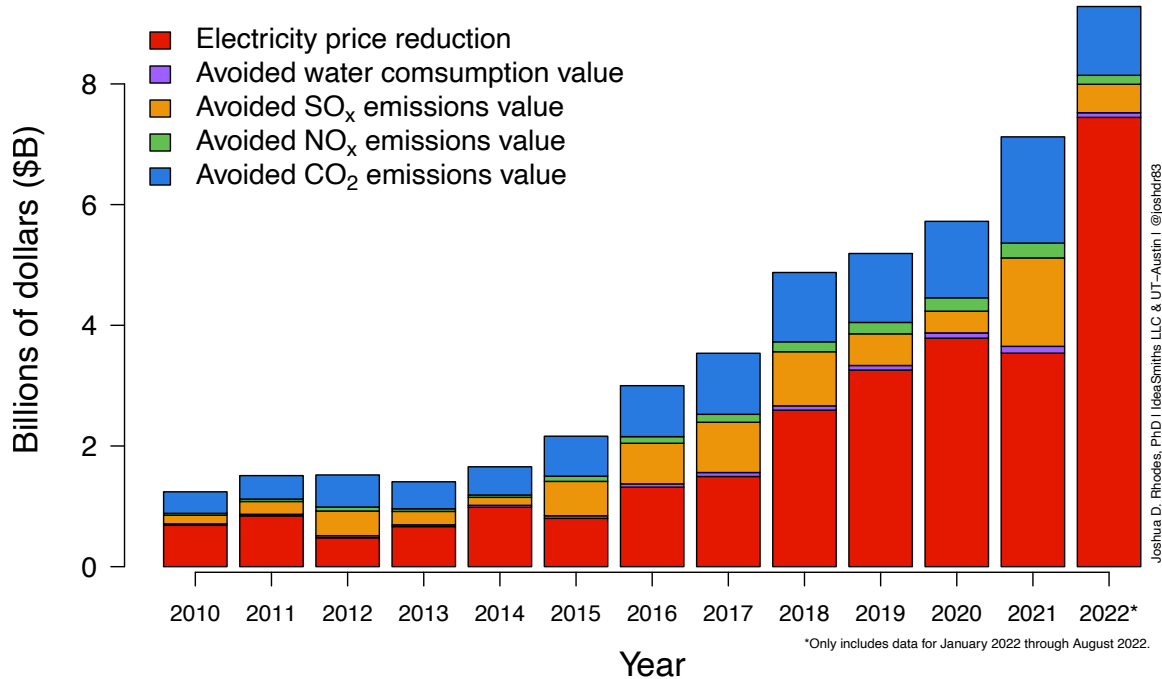
Joshua D. Rhodes, PhD
January 2023

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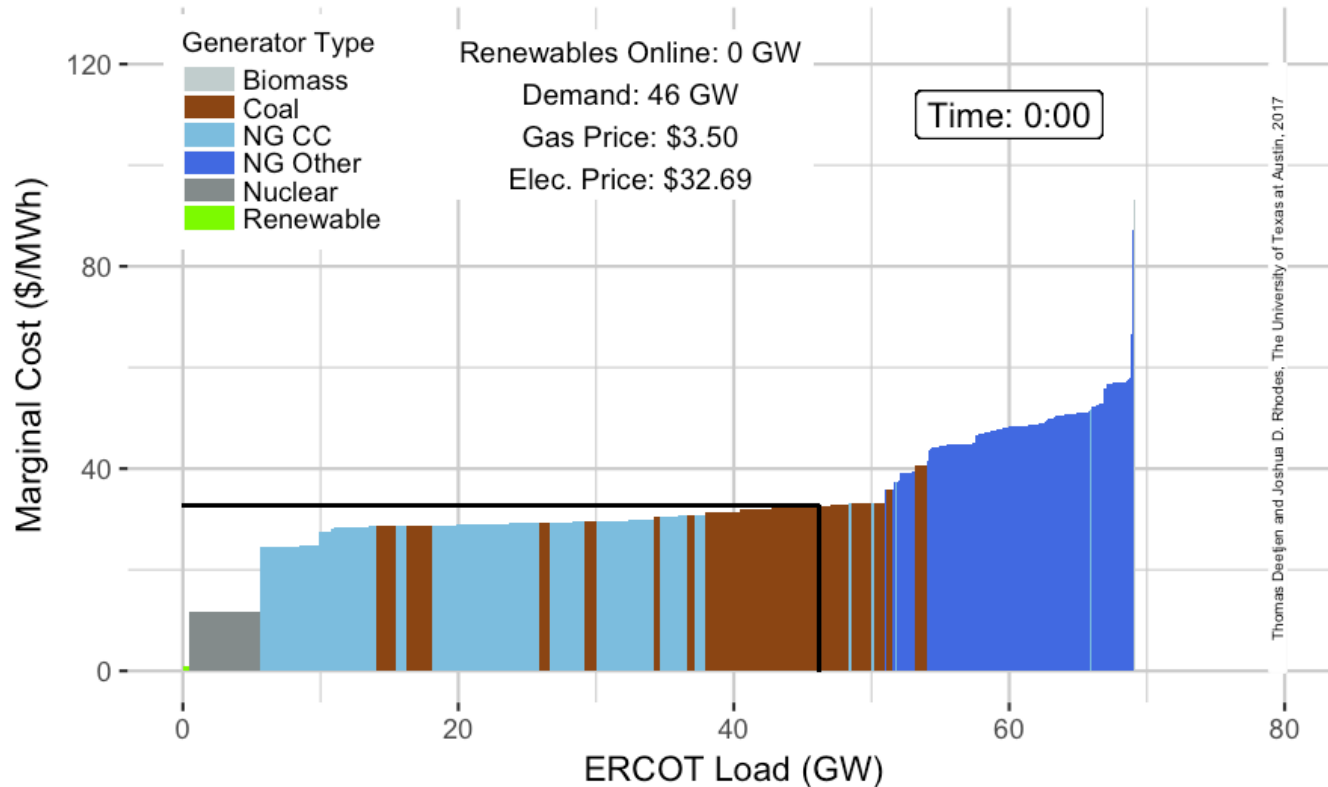


“The Impact of Renewables in ERCOT” looked at the impact of wind and solar on power plant operations since 2010

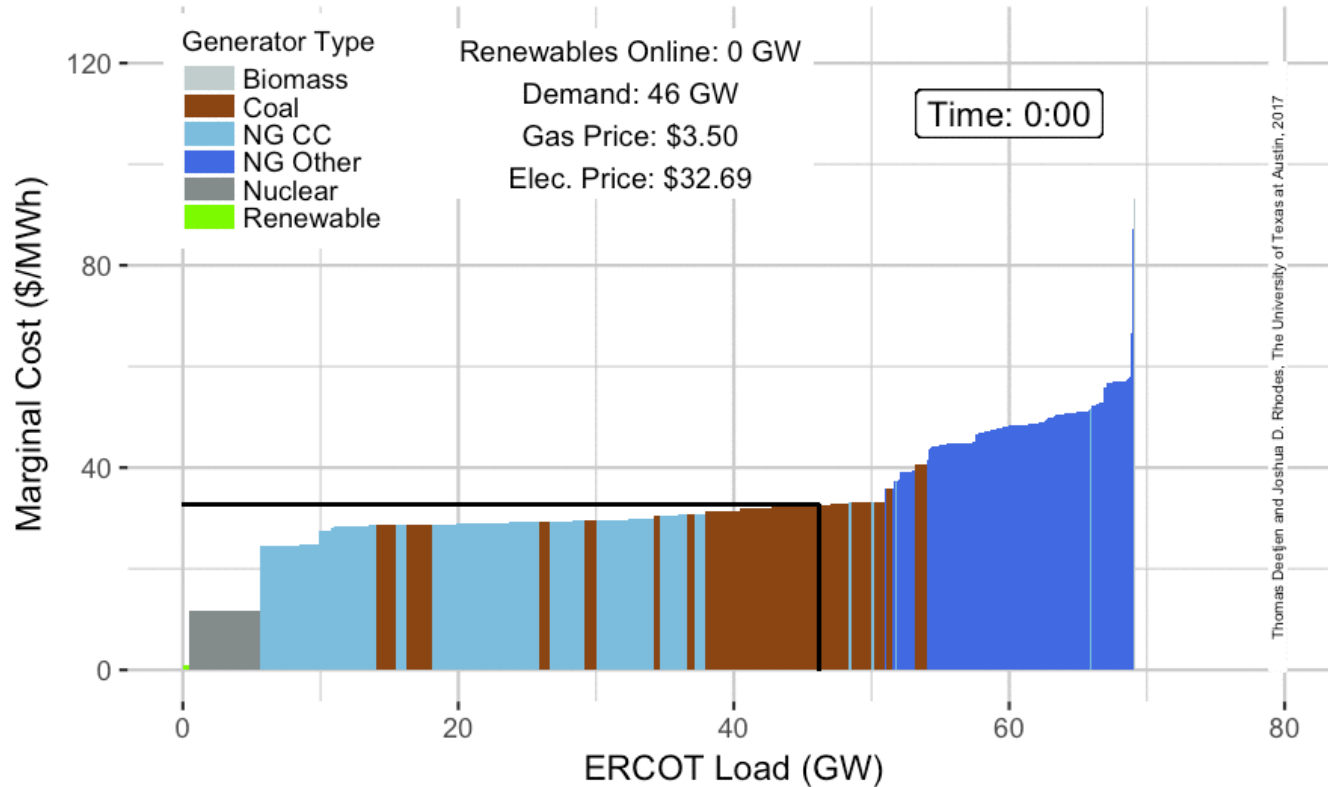
Annual total benefits from renewables in ERCOT



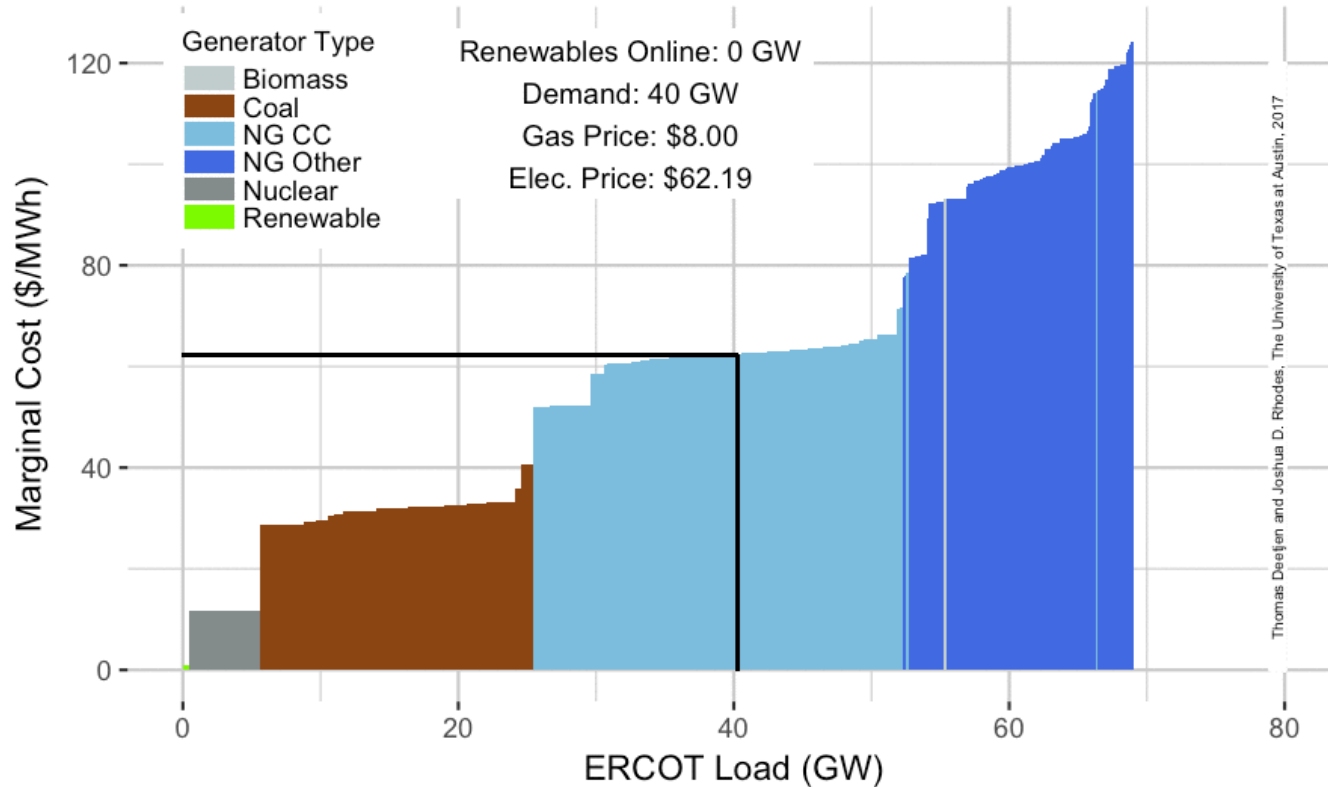
To do so, we ran a (very) simplified ERCOT grid model based on a bid stack approach



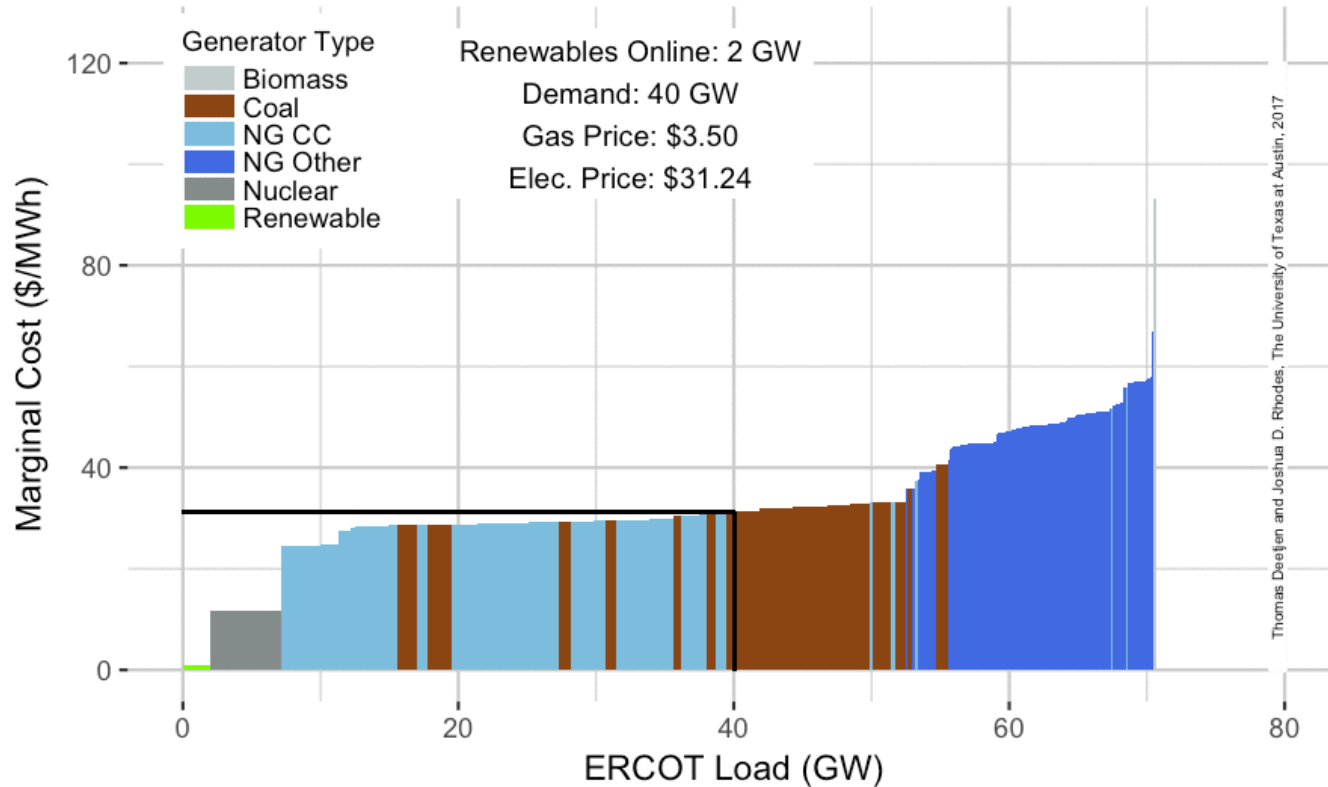
But, of course, demand is not a constant



Fuel prices also change

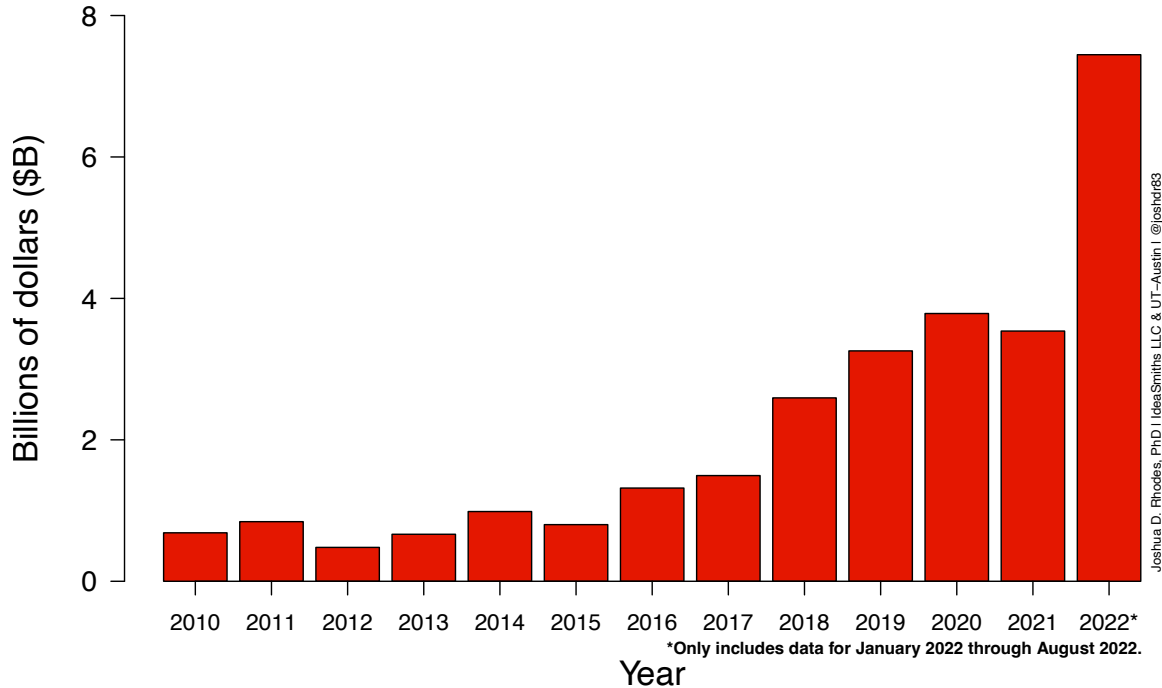


Renewables coming online also change the bid stack



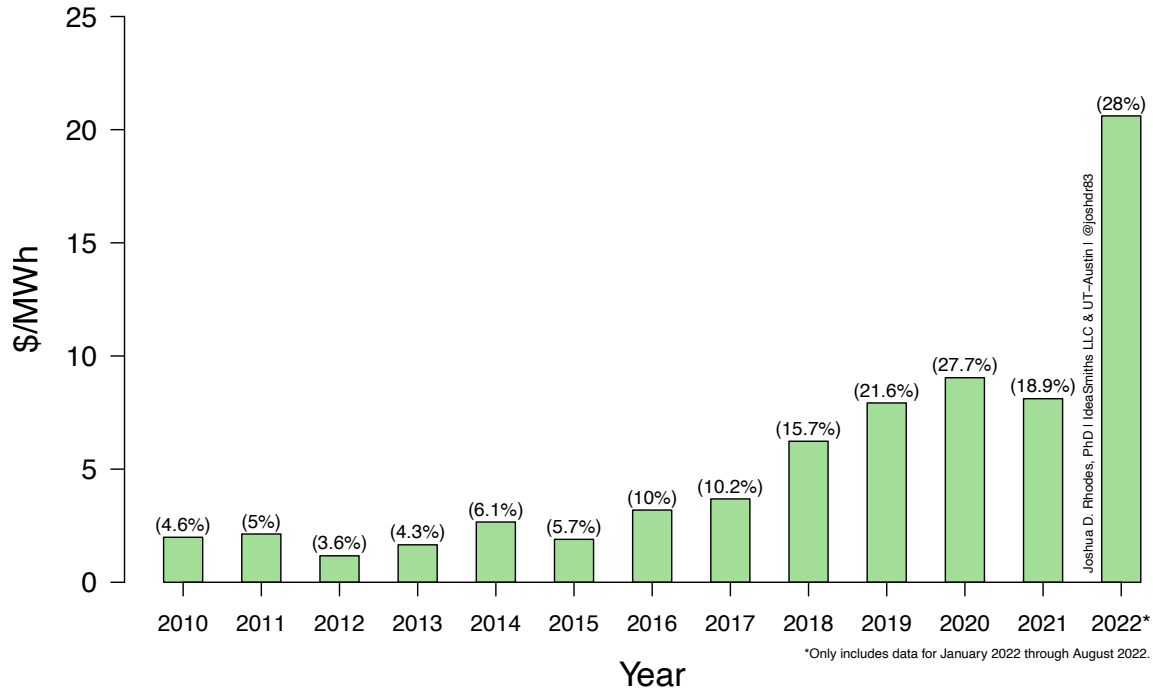
Renewables have reduced wholesale market prices in ERCOT by about \$27.8B since 2010

Annual wholesale electricity cost reductions from renewables in ERCOT



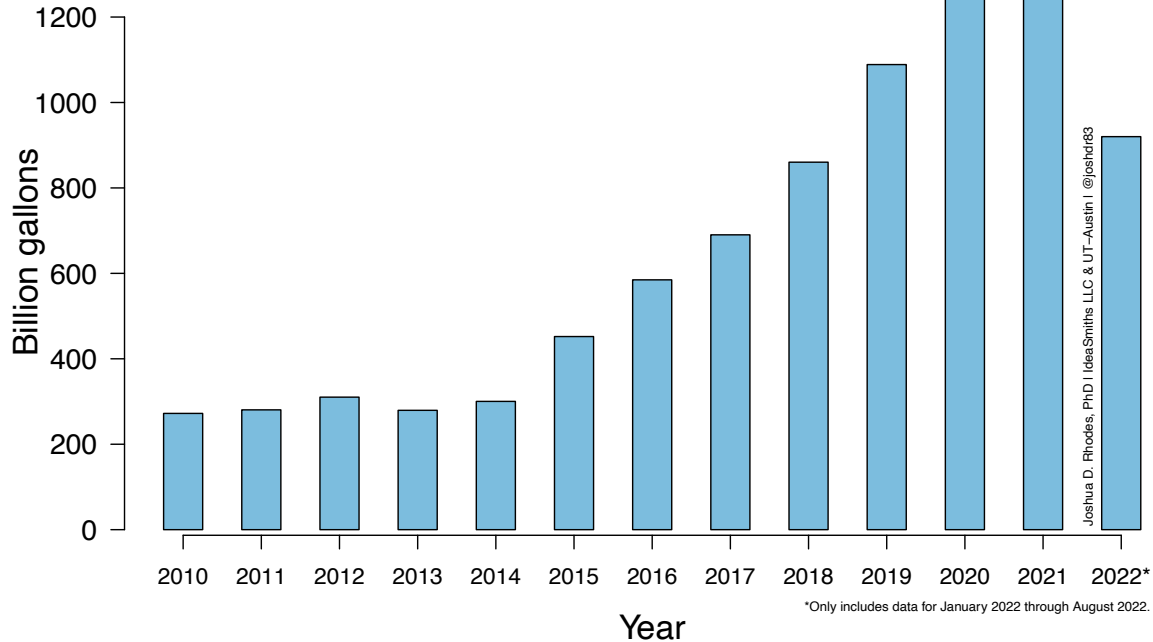
Wholesale price reductions have generally increased as renewables have increased

Average wholesale market price reduction in ERCOT due to renewables



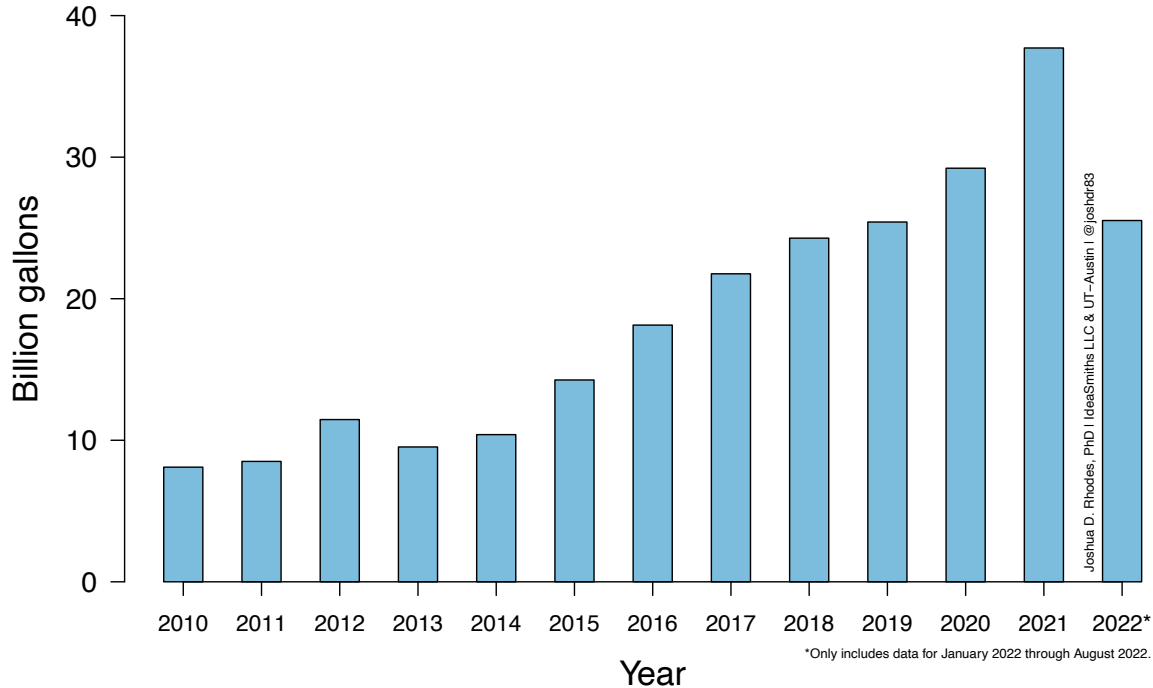
Renewables in ERCOT resulted in about 8.7T fewer gallons of water winthdrawls

Avoided water withdrawals because of renewables in ERCOT



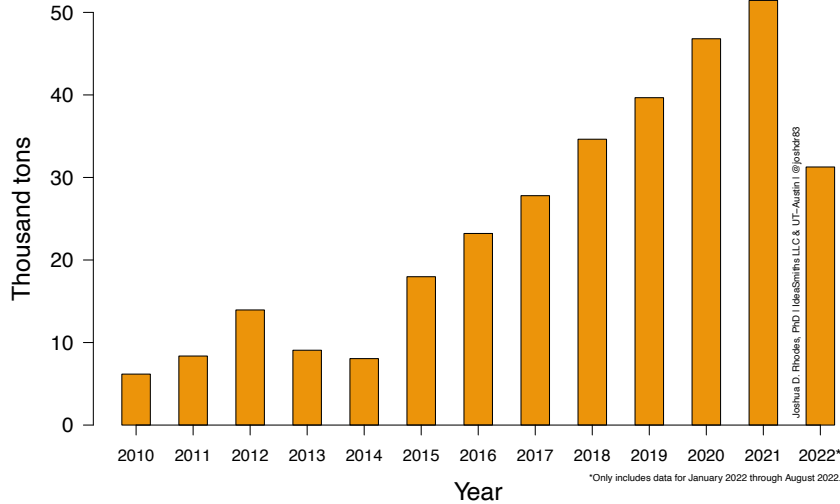
Of those withdrawals, 244B fewer gallons of water were consumed in the power sector

Avoided water consumption because of renewables in ERCOT

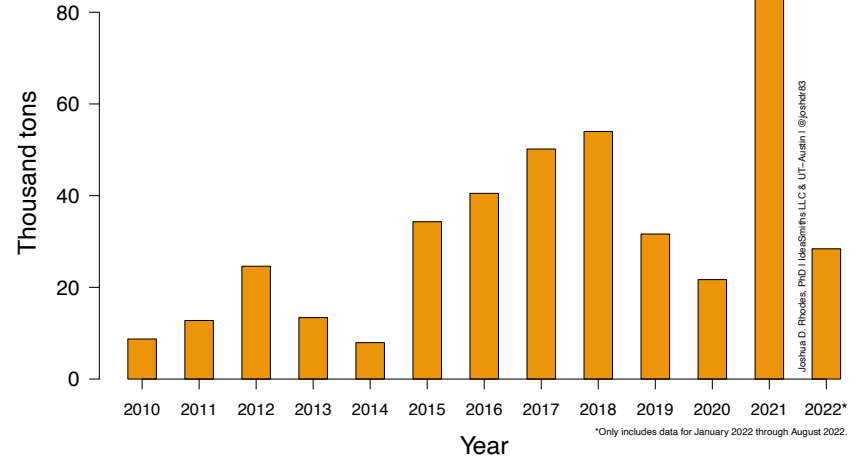


Renewables also reduced NO_x and SO₂ emissions in ERCOT by 318 and 416 thousand tons since 2010

Avoided NO_x emissions because of renewables in ERCOT

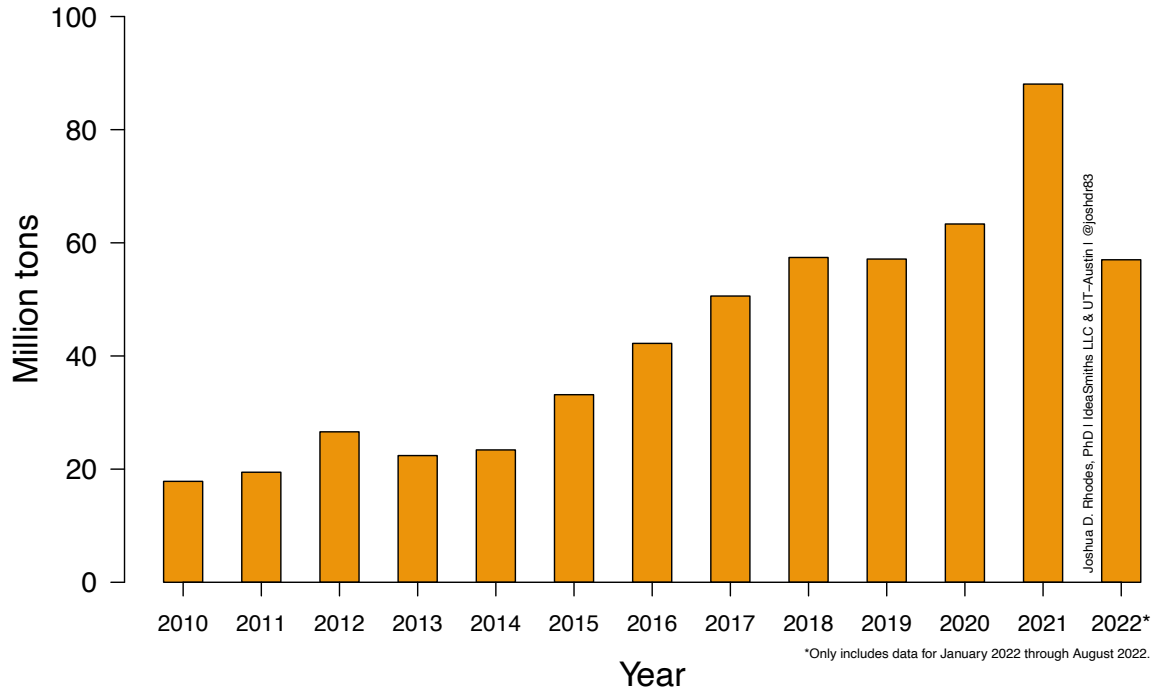


Avoided SO₂ emissions because of renewables in ERCOT



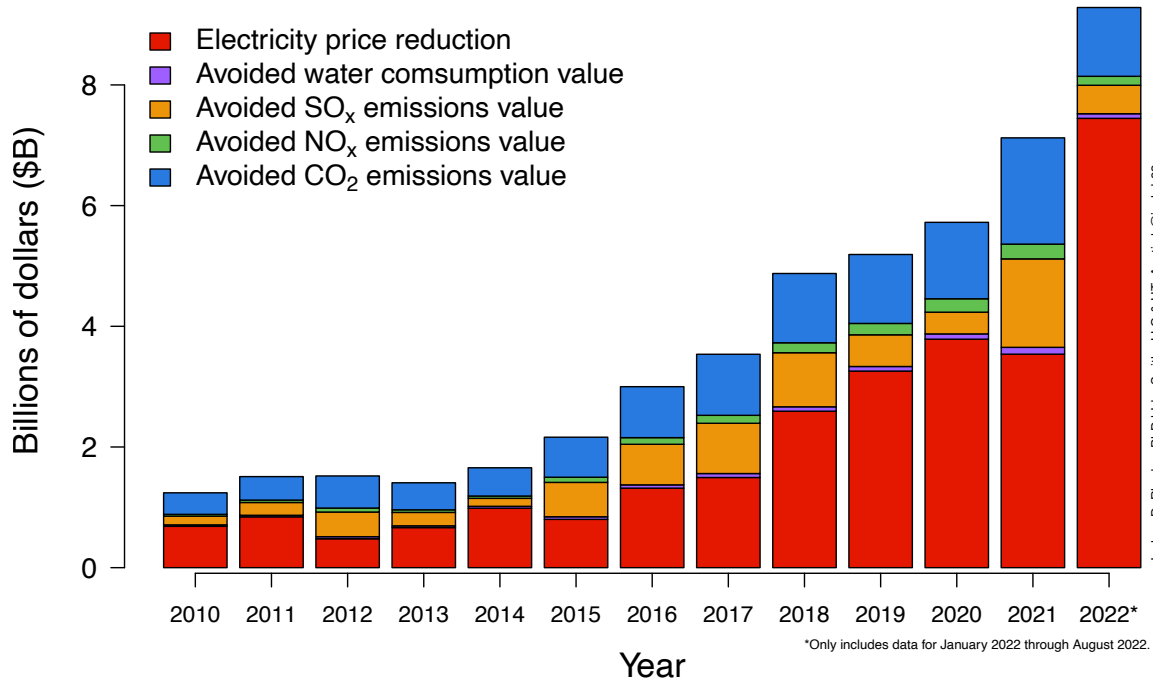
Renewables also resulted in about 558 fewer million tons of CO₂ emissions

Avoided CO₂ emissions because of renewables in ERCOT



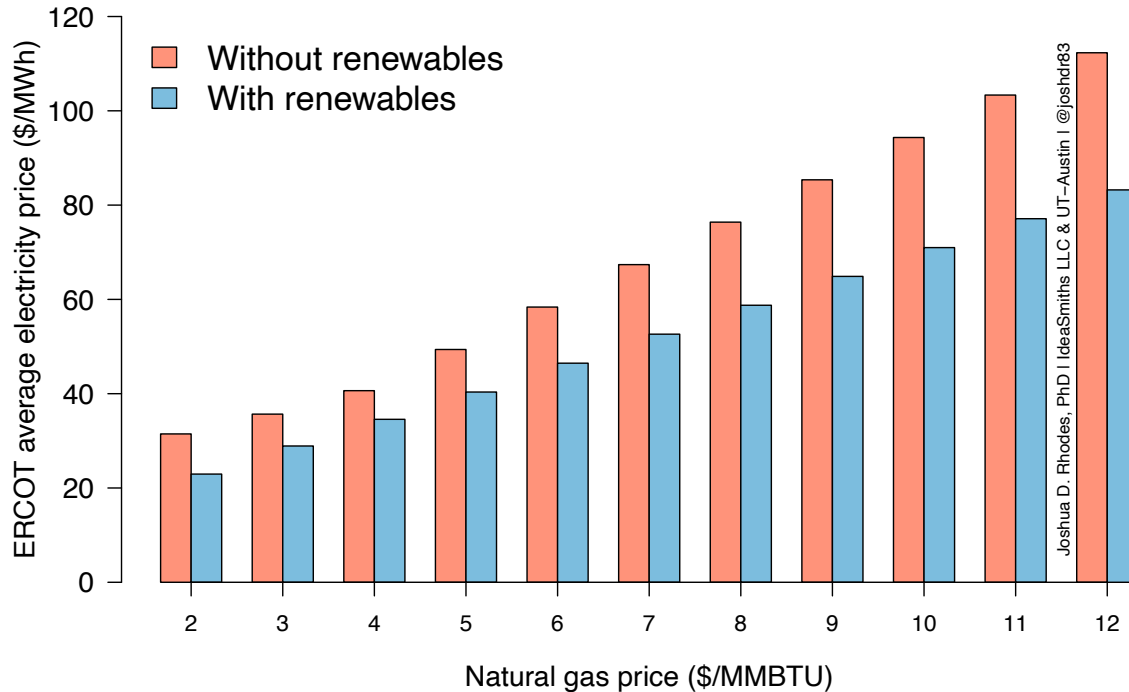
Utilizing median values for each benefit type yielded over \$40B in benefits over the years

Annual total benefits from renewables in ERCOT



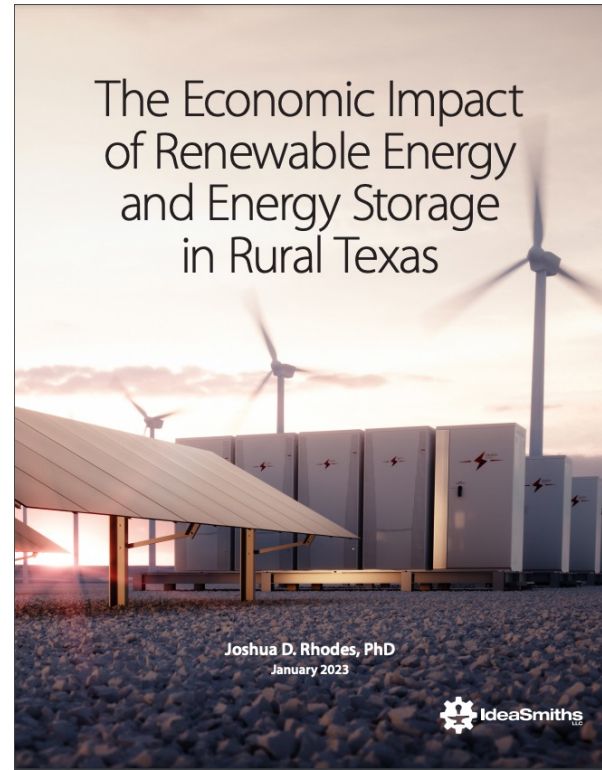
We also found that renewables can act as a hedge against high fuel prices in the electricity sector

Average ERCOT electric wholesale market price at various natural gas prices

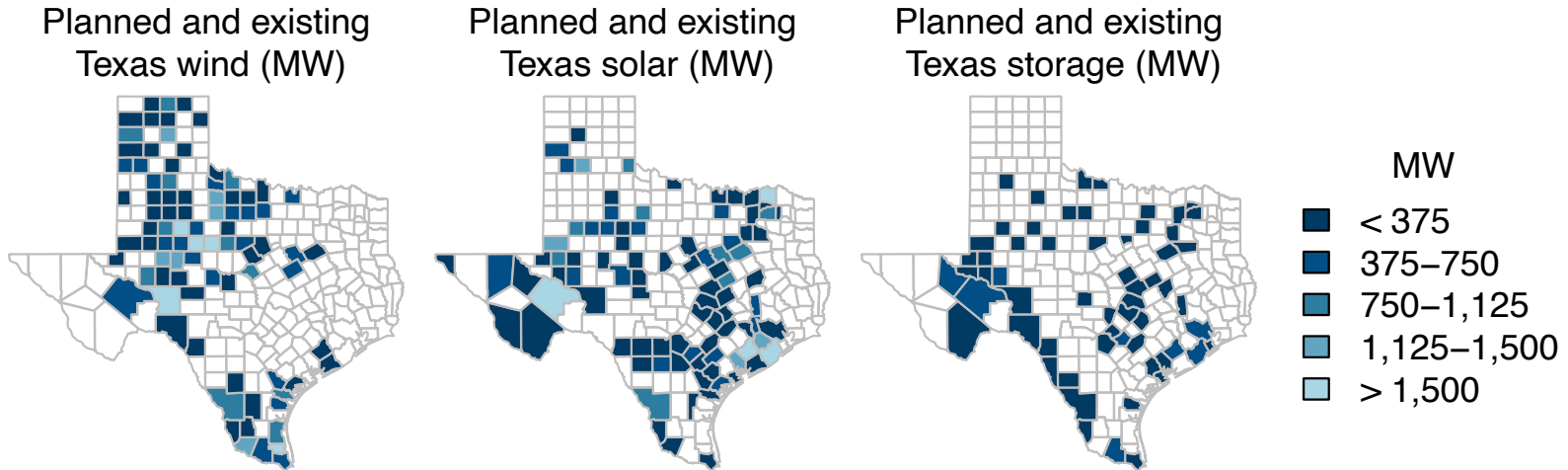


While the first study looked at the grid benefits of renewables, the second study looked at the local benefits

- Existing and planned utility-scale wind, solar, and energy storage projects will pay between \$12.5 billion and \$15.9 billion in total tax revenue over their lifetimes
- Existing utility-scale wind, solar, and energy storage projects will pay Texas landowners \$11.8–\$21.7 billion over the existing and planned project lifetimes
- Over 60% of the taxes and landowner payments are paid in rural counties



Wind, solar, and energy storage projects are generally spread across Texas



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This project utilized Chapter 313 tax abatement data from the Texas Comptroller to estimate lifetime wind and solar property taxes

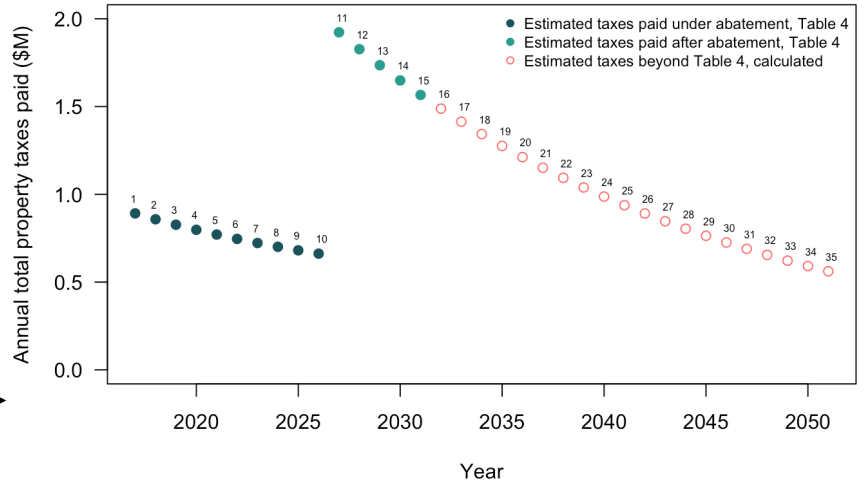
Table 4 examines the estimated direct impact on ad valorem taxes to the school district and Reagan County, with all property tax incentives sought being granted using estimated market value from the application. The project has applied for a value limitation under Chapter 313, Tax Code and tax abatement with Reagan County and Reagan County Hospital District.

The difference noted in the last line is the difference between the totals in Table 3 and Table 4.

Year	Estimated Taxable Value for I&S	Estimated Taxable Value for M&O	Tax Rate ¹	Reagan County ISD I&S Tax Levy	Reagan County ISD M&O Tax Levy	Reagan County ISD M&O and I&S Tax Levies	Reagan County Tax Levy	Reagan County Hospital Tax Levy	Reagan County Water District Tax Levy	Estimated Total Property Taxes
			0.1000	1.1000	1.2000	0.21	0.1984	0.1114		
2017	\$236,200,000	\$25,000,000	\$236,200	\$275,000	\$501,200	\$71,536	\$66,945	\$251,825		\$891,306
2018	\$210,366,000	\$25,000,000	\$210,366	\$275,000	\$483,366	\$71,536	\$66,945	\$234,011		\$857,858
2019	\$195,640,380	\$25,000,000	\$195,640	\$275,000	\$470,640	\$71,536	\$66,945	\$217,630		\$826,753
2020	\$181,940,513	\$25,000,000	\$181,940	\$275,000	\$456,940	\$71,536	\$66,945	\$202,396		\$797,823
2021	\$169,209,365	\$25,000,000	\$169,209	\$275,000	\$444,209	\$71,536	\$66,945	\$188,238		\$770,919
2022	\$157,364,709	\$25,000,000	\$157,365	\$275,000	\$432,365	\$71,536	\$66,945	\$175,053		\$745,898
2023	\$146,349,179	\$25,000,000	\$146,349	\$275,000	\$421,349	\$71,536	\$66,945	\$162,799		\$722,629
2024	\$136,104,717	\$25,000,000	\$136,105	\$275,000	\$411,105	\$71,536	\$66,945	\$151,403		\$700,989
2025	\$126,577,409	\$25,000,000	\$126,577	\$275,000	\$401,577	\$71,536	\$66,945	\$140,805		\$680,863
2026	\$117,716,987	\$25,000,000	\$117,717	\$275,000	\$392,717	\$71,536	\$66,945	\$130,948		\$662,140
2027	\$111,831,138	\$111,831,138	\$111,831	\$1,230,143	\$1,341,974	\$234,845	\$221,873	\$124,401		\$1,923,093
2028	\$106,239,581	\$106,239,581	\$106,240	\$1,168,635	\$1,274,875	\$223,103	\$210,779	\$118,141		\$1,826,938
2029	\$100,927,602	\$100,927,602	\$100,928	\$1,110,204	\$1,211,131	\$211,948	\$200,240	\$112,272		\$1,735,591
2030	\$95,881,222	\$95,881,222	\$95,881	\$1,054,693	\$1,150,575	\$201,381	\$190,228	\$106,639		\$1,648,812
2031	\$91,087,161	\$91,087,161	\$91,087	\$1,001,059	\$1,093,046	\$197,283	\$180,717	\$101,325		\$1,566,371
				Total	\$10,489,075	\$1,777,890	\$1,673,288	\$2,417,736		\$16,367,889
				Diff	\$16,592,217	\$2,786,336	\$2,638,993	\$0		\$21,017,645

Source: CPA, Santa Rita Wind Energy LLC
¹Tax Rate per \$100 Valuation

Estimated taxes paid by the Santa Rita Wind Farm



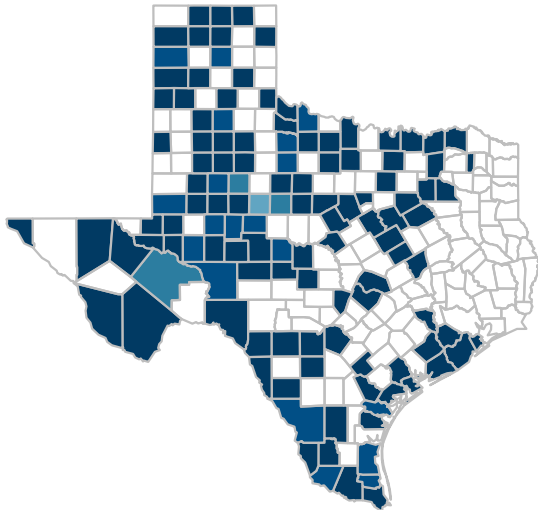
Landowner payments and all energy storage data were collected from companies and clean energy law firms

- Surveyed over a dozen energy storage companies
 - Storage never qualified for Chapter 313
- Landowner payment data were obtained from discussions with clean energy law firms
 - Contracts are confidential
 - Data obtained were averages, with spatial differentiation

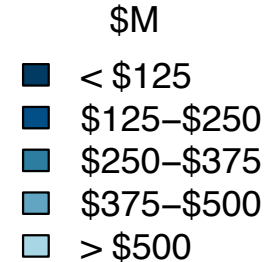
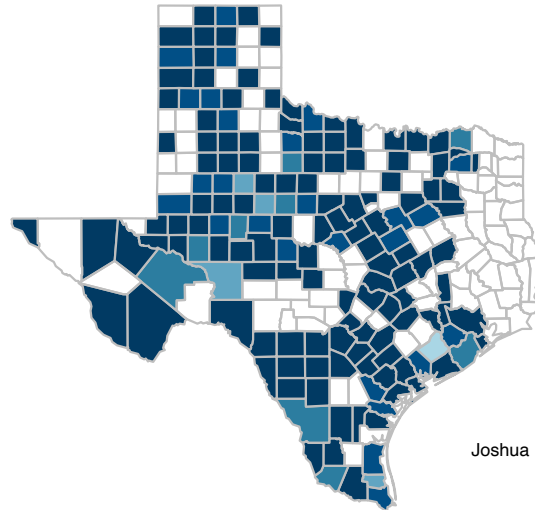


Renewables and energy storage are expected to pay between \$12.5 billion and \$15.9 billion in taxes

Existing wind, solar, and storage taxes (\$M)



Planned and existing wind, solar, and storage taxes (\$M)

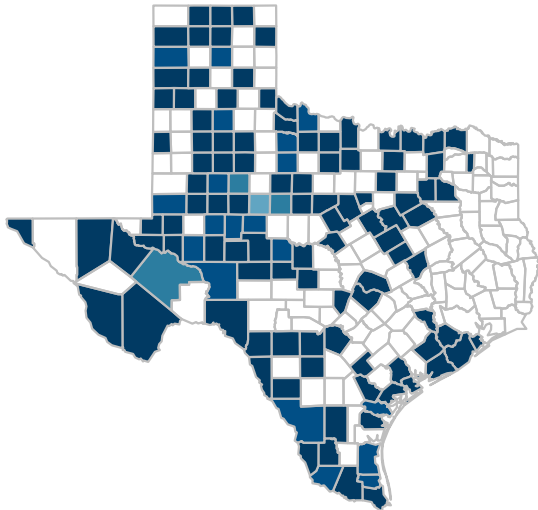


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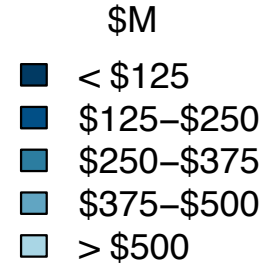
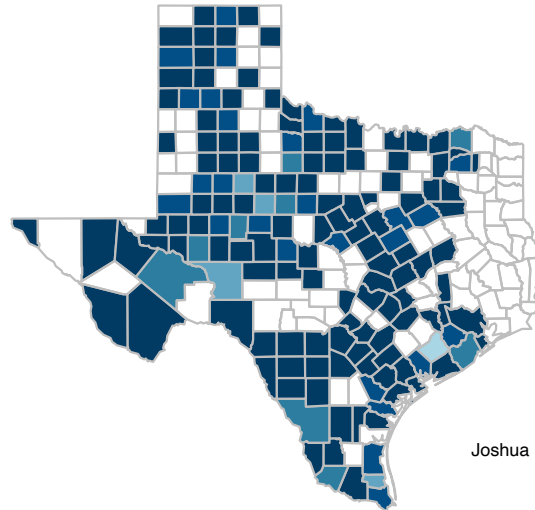


Renewables and energy storage are expected to make between \$11.8 billion and \$21.7 billion in landowner payments

Existing wind, solar, and storage landowner payments (\$M)



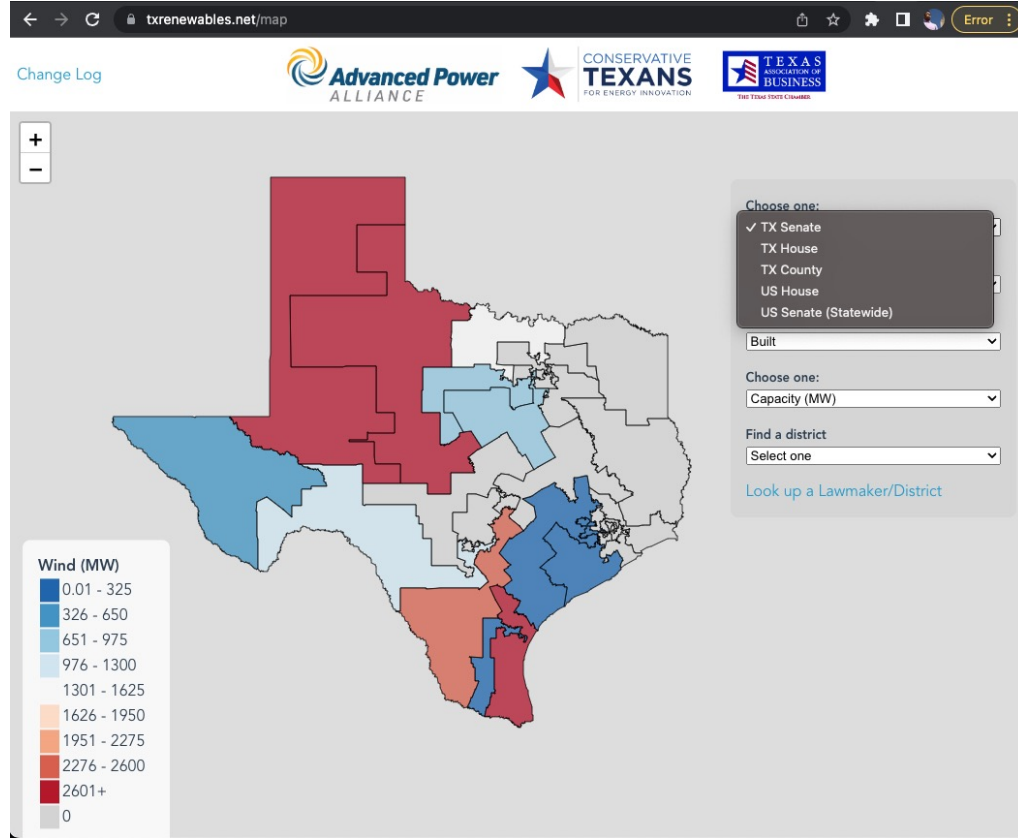
Planned and existing wind, solar, and storage landowner payments (\$M)



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We took this work further and created an interactive website to visualize the data across multiple jurisdictions



We also allow users to download dossiers on each location that include lists of all local projects

The screenshot shows the 'txrenewables.net' web application. At the top, there are logos for 'Advanced Power Alliance', 'CONSERVATIVE TEXANS FOR ENERGY INNOVATION', and 'TEXAS ASSOCIATION OF BUSINESS'. A map of Texas is displayed with various regions highlighted in different colors. A legend on the left indicates wind power capacity ranges in MW: 0.01 - 325, 326 - 650, 651 - 975, 976 - 1300, 1301 - 1625, 1626 - 1950, 1951 - 2275, and 2276 - 2600. A white popup window is centered over the map, titled 'Download Data for Texas Senate District 28', with a blue 'Download' link and a 'Close' button. The background interface includes a 'Change Log' button, zoom controls, and a 'Choose one' dropdown menu.

1

2

3

Texas Senate District 28, Charles Perry (R):

Type	Facility Name	Facility Size (MW)	Local Taxes (\$M) ¹	Local Landowner Payments (\$M) ²
Wind	SAGE DRAW WIND U1	169.2	31.8	34.0
Wind	SAGE DRAW WIND U2	169.2	31.8	34.0
Wind	Cirrus Wind 1 LLC	61.2	11.5	12.3
Wind	TAHOKA WIND 1	150.0	28.2	30.1
Wind	TAHOKA WIND 2	150.0	28.2	30.1
Wind	Lorenzo Wind, LLC	80.0	15.0	16.1
Wind	TG EAST WIND U4	207.2	39.0	41.6
Wind	TG EAST WIND U2	44.8	8.4	9.0
Wind	TG EAST WIND U3	42.0	7.9	8.4
Wind	HORSE CREEK WIND 2	98.9	18.6	19.9
Wind	Pleasant Hill Wind Energy LLC	20.0	3.8	4.0
Wind	MCADOO WIND	150.0	28.2	30.1
Wind	SEYMOUR HILLS WIND (S_HILLS WIND)	30.2	5.7	6.1
Wind	BLUE SUMMIT WIND 3 A	13.4	2.5	2.7
Wind	TG EAST WIND U1	42.0	7.9	8.4
Wind	WAKE WIND 1	114.9	21.6	23.1
Wind	Ralls Wind Farm LLC	10.0	1.9	2.0
Wind	VERA WIND V110	34.0	6.4	6.8
Wind	BLUE SUMMIT WIND 1 A	8.8	1.7	1.8
Wind	WESTERN TRAIL WIND (AJAX WIND) U1	225.6	42.4	45.3
Wind	WILLOW SPRINGS WIND B	125.0	23.5	25.1
Wind	BLUE SUMMIT WIND 2 B	6.7	1.3	1.3
Wind	GREEN PASTURES WIND I	150.0	28.2	30.1
Wind	VERA WIND	208.8	39.3	42.0
Wind	HORSE CREEK WIND 1	131.1	24.6	26.4
Wind	BLUE SUMMIT WIND 3 B	182.4	34.3	36.7
Wind	BLUE SUMMIT WIND 2 A	89.7	16.9	18.0
Wind	FOARD CITY WIND 1 B	163.8	30.8	32.9



A special thank you to the funders and collaborators of this work

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- Advanced Power Alliance
- Texas Association of Business
- Drs. Michael E. Webber and Charles R. Upshaw



Questions?

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