

Don't Mess with Texas
Getting the Lone Star State to Net-Zero by 2050

Appendix E

Full REMI Results

April 2022



Appendix E: Full REMI Results

The following Appendix was prepared by Brian Lewandowski at the University of Colorado, Boulder Leeds School of Business as “Economic Impact of Decarbonization Scenarios in Texas.”

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DEFINITIONS

Employment: Includes the number of full-time and part-time jobs (headcount) by business physical location.

Deflators: Measure of price changes within an industry.

Gross Domestic Product (GDP): Total value of final goods and services produced each year within a country or region.

Leakage: Economic activity that occurs outside the area of study but is driven by activity within the study area.

Multiplier: Change in total economic activity driven by a change in direct economic activity.

Output: Total production value of goods and services, including intermediate goods purchased and value added.

Personal Income: Includes all sources of income, including employee compensation, proprietors' income, rental income, capital income, and transfer payments.

Rates: Change in retail consumption spending in order to accommodate changes in utility operations and capital expenditures.

SUMMARY

Excluding any cost of emissions, for the scenarios examined, the percentage change in jobs, GDP, and personal income ranged between -1% and +5% on the Texas economy. The Electrification and the Electrification: Accelerated Clean Power scenarios had slightly negative impacts to the economy overall, while the Hydrogen and Carriers and Extensive Capture scenarios have net positive economic impacts. The Hydrogen and Carriers scenario resulted in the largest economic benefits.

To frame the analysis of this report, an increase in capital expenditures in Texas increases economic activity, while a decrease in operating expenditures reduces economic activity in Texas. Conversely, a decrease in customer rates is a reduction in costs for utility customers, thus resulting in additional spending in other industries. The data are analyzed collectively to consider if the project provides a *net* economic benefit to Texas. Given that Texas is rich in native energy production (oil, gas, and coal), the state experiences a more significant economic impact with changes in energy production compared to states that have fewer natural energy resources.

Each yielded varying economic impacts for the state of Texas and the subregions. The largest economic benefits derived from the Hydrogen and Carriers scenario, driven by extraordinary capital investment and fuel sector (hydrogen) revenue compared to the other scenarios. The hydrogen scenario has an average net economic benefit of \$122 billion to the state of Texas compared to the business-as-usual (BAU) scenario, and adds 766,000 jobs over the 30-year horizon. The second-largest impact derived from the extensive capture scenario, averaging \$34 billion in economic benefits and 204,000 additional jobs above BAU. The extensive capture scenario assumes BAU conditions with all emissions abated through capture technology, so it sees no impact to the energy industry and fuel production; it only grows a large direct air capture industry.

The Electrification scenario (-\$14 billion, -6,000 jobs) and Electrification: Accelerated Clean Power scenario (-\$15 billion, -17,000 jobs) yielded similar economic impacts, both reducing economic activity and jobs in the state. These scenarios both see net benefits to the power sector and nonenergy industry, but losses from decreased fuels production offset these benefits. Fuel production decreases commensurately with decreased domestic consumption within Texas; each barrel of oil no longer consumed in state results in one less barrel of oil produced. However, exports are assumed to stay

constant at BAU levels in all scenarios. Realistically, exports may fall in the future if the market for fossil fuels dwindle in a net-zero world.

By region, the Hydrogen and Carriers scenario results in economic benefits that span all regions, and the Extensive Capture scenario leads to increased economic activity in all regions but one.

TABLE 1: SCENARIO AVERAGE ANNUAL IMPACT BY SCENARIO, JOBS AND GDP

	EXTENSIVE CAPTURE	ELECTRIFICATION	ELECTRIFICATION ACCELERATED CLEAN POWER	HYDROGEN AND CARRIERS
All Regions	2021-2050	2021-2050	2021-2050	2021-2050
Jobs				
Energy Grid	248,063	168,401	169,926	254,381
Capital Investment	98,746	90,019	103,461	170,522
Fixed	133,291	106,477	112,051	117,655
Variable	(23,281)	(16,075)	(15,000)	10,917
Rates	39,308	(12,021)	(30,585)	(44,713)
Nonenergy Industry	(3,299)	91,286	84,890	(91,585)
Fuel Sector	(40,704)	(266,032)	(272,253)	600,928
Total	204,061	(6,345)	(17,437)	763,725
GDP (Ths, Fixed 2018 \$)				
Energy Grid	40,559,825	25,298,840	25,810,470	37,612,323
Capital Investment	21,418,641	16,921,196	19,454,164	29,309,783
Fixed	16,953,661	13,614,972	14,534,930	15,068,465
Variable	(2,829,539)	(1,909,791)	(1,774,124)	2,922,341
Rates	5,017,061	(3,327,537)	(6,404,498)	(9,688,266)
Nonenergy Industry	974,957	12,923,722	12,222,928	(12,597,908)
Fuel Sector	(7,185,044)	(51,973,505)	(52,966,859)	96,999,431
Total	34,349,738	(13,750,943)	(14,933,460)	122,013,846

TABLE 2: SCENARIO AVERAGE ANNUAL IMPACT BY REGION, JOBS AND GDP

	EXTENSIVE CAPTURE	ELECTRIFICATION	ELECTRIFICATION ACCELERATED CLEAN POWER	HYDROGEN AND CARRIERS
All Regions	2021-2050	2021-2050	2021-2050	2021-2050
Jobs				
Alamo	14,991	(3,422)	357	42,345
Capital	14,845	8,278	11,148	74,937
Central	675	(1,415)	(5,482)	40,845
Gulf	6,099	(63,386)	(60,040)	181,499
High Plains	33,829	6,944	4,635	45,258
Metroplex	80,915	43,335	36,476	219,718
Northwest	34,746	13,355	7,881	43,336
South	2,521	(4,740)	(4,877)	48,283
East	2,012	(1,296)	(1,914)	39,738
<u>West</u>	<u>13,429</u>	<u>(3,998)</u>	<u>(5,622)</u>	<u>27,765</u>
Total	204,061	(6,345)	(17,437)	763,725
GDP (Ths, Fixed 2018 \$)				
Alamo	2,523,406	(1,954,771)	(1,157,221)	6,021,176
Capital	2,254,671	1,128,911	1,910,888	10,862,622
Central	136,419	(489,744)	(1,274,963)	9,972,164
Gulf	1,788,472	(13,225,775)	(12,556,520)	24,341,973
High Plains	5,444,716	(434,397)	(907,839)	8,819,468
Metroplex	14,407,809	7,504,994	6,361,919	36,398,982
Northwest	4,856,669	1,027,431	263,246	7,777,725
South	194,704	(1,801,215)	(1,931,365)	7,063,964
East	(266,015)	(1,849,438)	(1,624,602)	8,801,760
<u>West</u>	<u>3,008,889</u>	<u>(3,656,940)</u>	<u>(4,017,004)</u>	<u>1,954,012</u>
Total	34,349,738	(13,750,943)	(14,933,460)	122,013,846

TABLE 3: SCENARIO AVERAGE ANNUAL IMPACT BY SCENARIO

		EXTENSIVE CAPTURE	ELECTRIFICATION	ELECTRIFICATION ACCELERATED CLEAN POWER	HYDROGEN AND CARRIERS
All Regions	Units	2021-2050	2021-2050	2021-2050	2021-2050
Total Employment	Individuals (Jobs)	204,061	(6,345)	(17,437)	763,725
Private Non-Farm Employment	Individuals (Jobs)	191,095	4,744	(4,492)	699,832
Residence Adjusted Employment	Individuals	204,330	(4,385)	(16,173)	748,723
Population	Individuals	239,721	(48,259)	(69,958)	940,933
Labor Force	Individuals	141,950	(22,679)	(34,645)	539,597
Gross Domestic Product	Thousands, Fixed 2018 \$	34,349,738	(13,750,943)	(14,933,460)	122,013,846
Output	Thousands, Fixed 2018 \$	43,520,846	(46,954,740)	(51,519,786)	170,842,722
Personal Income	Thousands, Fixed 2018 \$	20,848,220	(7,660,829)	(7,885,278)	78,560,293
Disposable Personal Income	Thousands, Fixed 2018 \$	18,920,227	(6,900,946)	(7,121,465)	71,472,815

TABLE 4: SCENARIO AVERAGE ANNUAL IMPACT BY SCENARIO, PERCENT CHANGE

	EXTENSIVE CAPTURE	ELECTRIFICATION	ELECTRIFICATION	HYDROGEN AND CARRIERS
			ACCELERATED CLEAN POWER	
All Regions	2021-2050	2021-2050	2021-2050	2021-2050
Total Employment	1.1%	0.0%	-0.1%	4.1%
Private Non-Farm Employment	1.2%	0.0%	0.0%	4.3%
Residence Adjusted Employment	1.1%	0.0%	-0.1%	4.1%
Population	0.7%	-0.1%	-0.2%	2.9%
Labor Force	0.9%	-0.1%	-0.2%	3.5%
Gross Domestic Product	1.4%	-0.6%	-0.6%	4.9%
Output	1.0%	-1.0%	-1.1%	3.8%
Personal Income	1.0%	-0.4%	-0.4%	3.7%
Disposable Personal Income	1.0%	-0.3%	-0.4%	3.6%

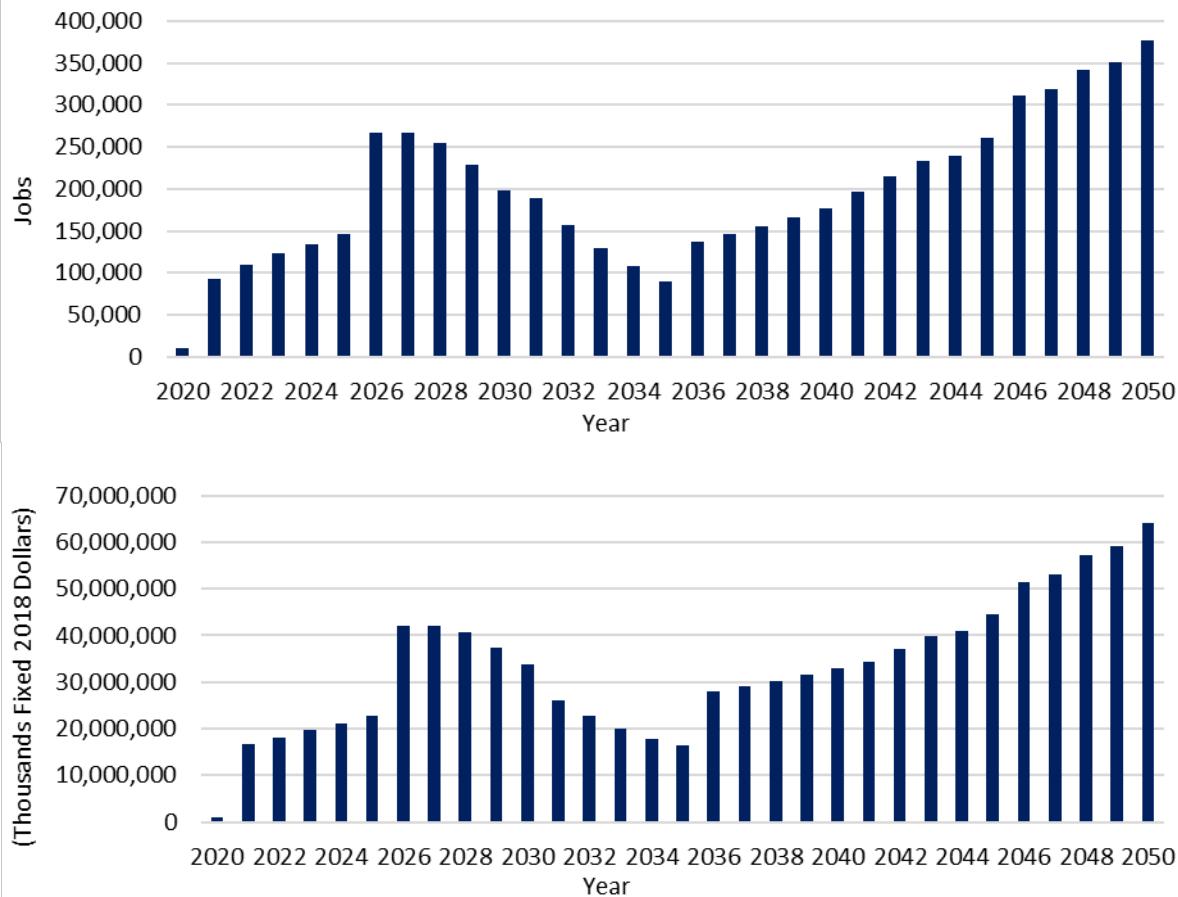
FIGURE 1: EXTENSIVE CAPTURE SCENARIO, AVERAGE ANNUAL IMPACT BY SCENARIO, JOBS AND GDP

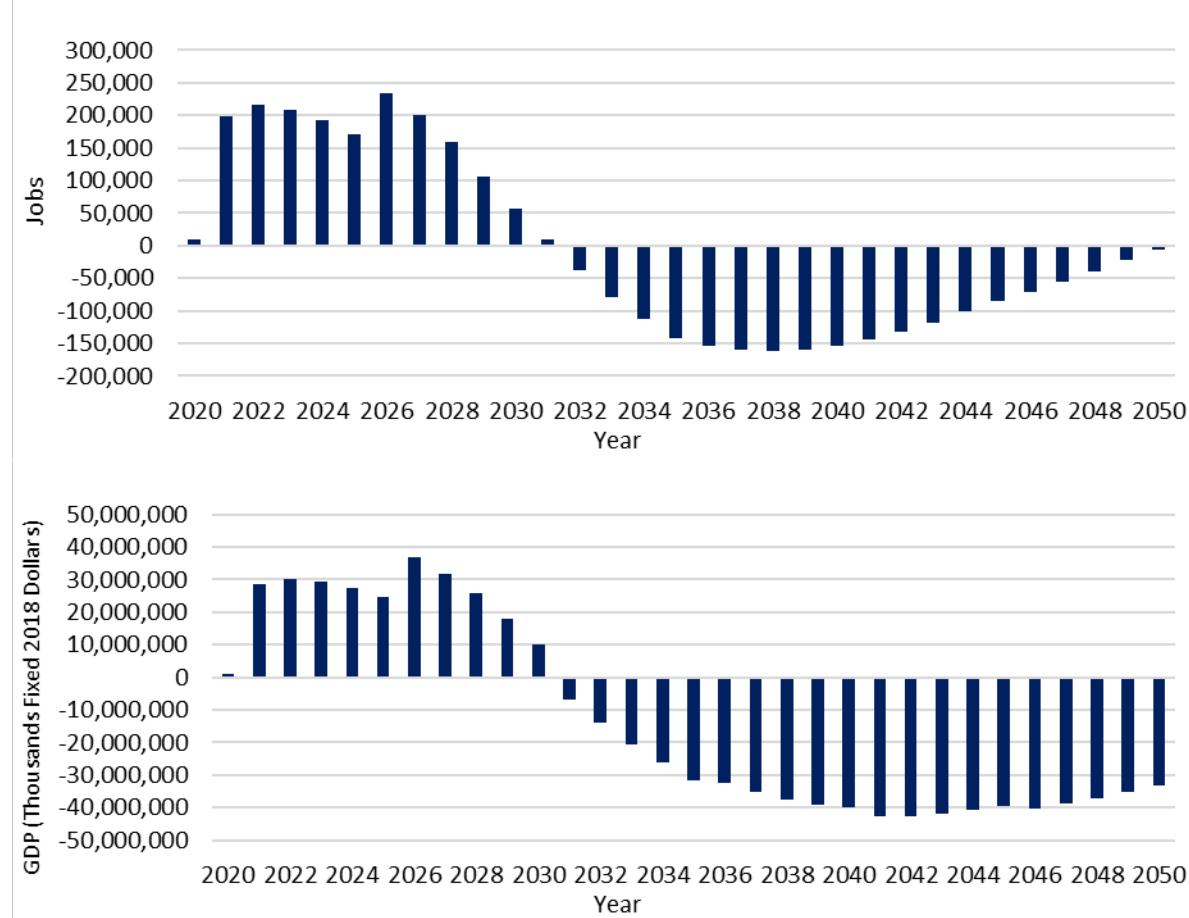
FIGURE 2: ELECTRIFICATION SCENARIO, AVERAGE ANNUAL IMPACT BY SCENARIO, JOBS AND GDP

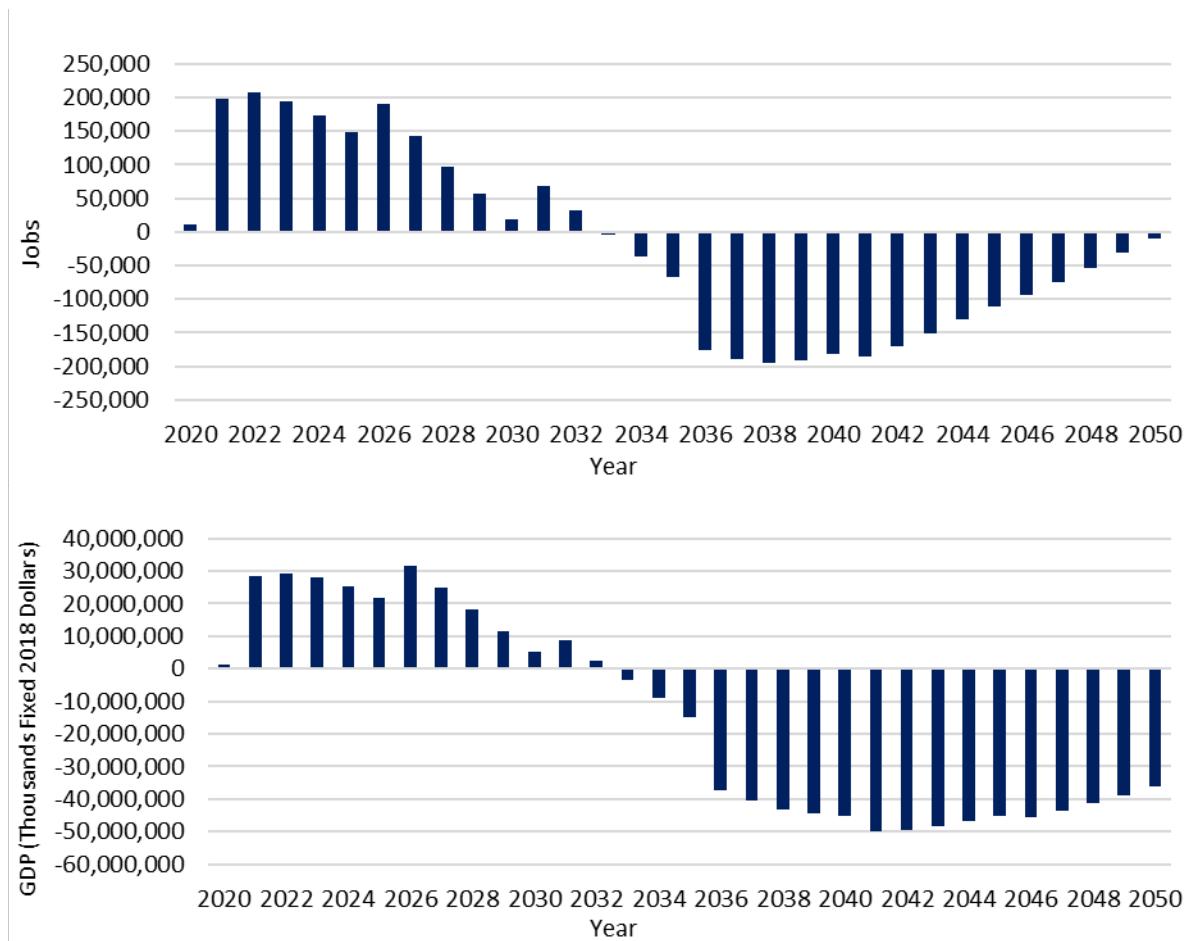
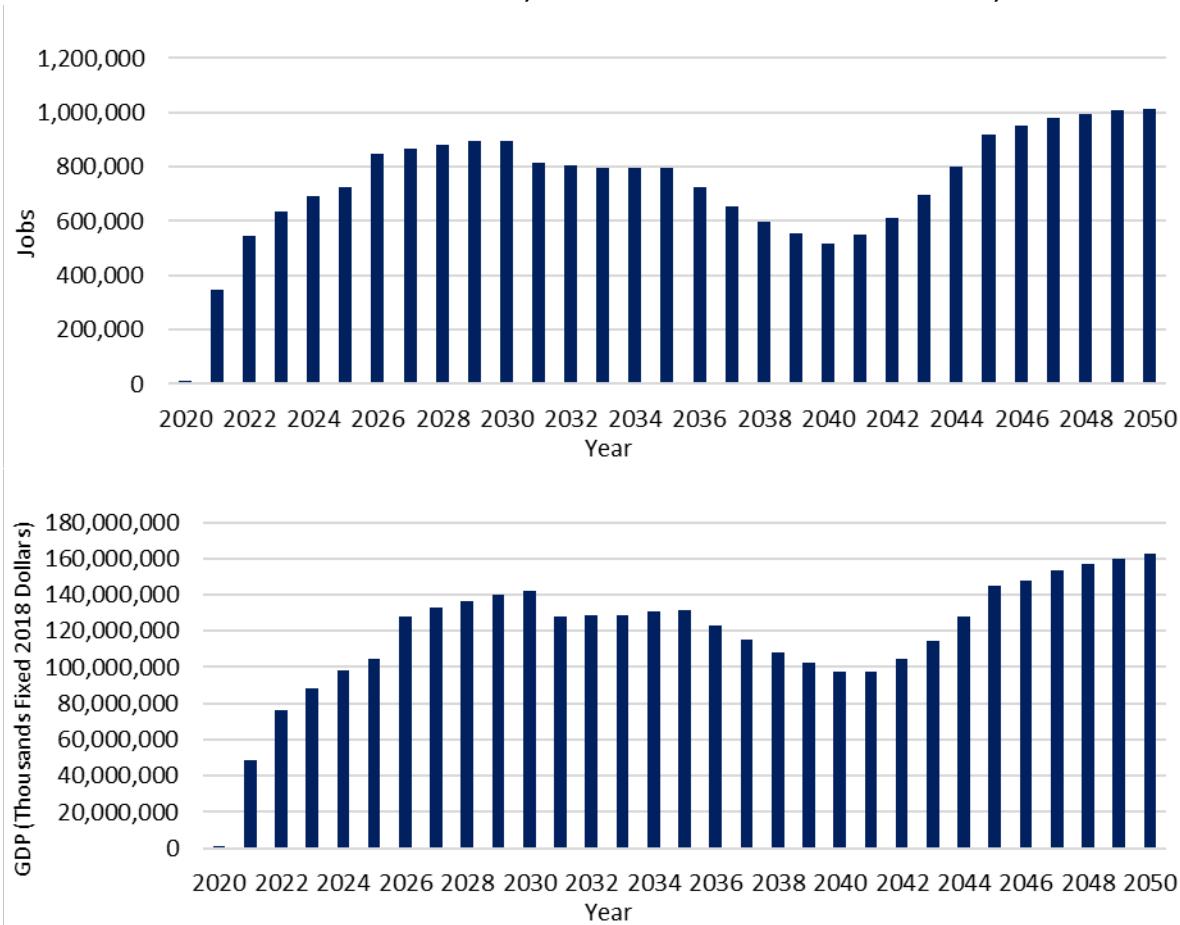
FIGURE 3: ELECTRIFICATION: ACCELERATED CLEAN POWER SCENARIO, AVERAGE ANNUAL IMPACT BY SCENARIO, JOBS AND GDP

FIGURE 4: HYDROGEN & CARRIERS SCENARIO, AVERAGE ANNUAL IMPACT BY SCENARIO, JOBS AND GDP

STUDY OVERVIEW AND METHODOLOGY

The Business Research Division of the Leeds School of Business at the University of Colorado Boulder partnered with the University of Texas at Austin's Webber Energy Group to conduct economic impact analyses on the net economic impact of alternative energy scenarios on the state of Texas. This study analyzed four deep decarbonization pathways for the state of Texas, using various scenarios to evaluate the economic and energy tradeoffs of reaching net zero emissions by 2050. The Business Research Division (BRD) at the University of Colorado's Leeds School of Business supported the Webber Energy Group's research efforts with economic impact analysis by quantifying energy tradeoff scenarios in terms of economic metrics (e.g., jobs, population, income, GDP, etc.).

This analysis examined four alternative economic scenarios compared to a business-as-usual (BAU) scenario, considering the changes in operating expenditures, capital expenditures, fixed costs, and consumer rate costs for the power sector; as well as the changes in other industry revenue (energy and nonenergy) due to changes in demand. According to the Webber Energy Group, BAU assumes,

“Texas continues the status quo. New policies are enacted but existing policies such as CAFE standards, investment tax credits (ITC), and production tax credits (PTC) are retained subject to their expirations or sunsets.”

The four alternative scenarios are denoted at Electrification, Electrification Accelerated Clean Power, Extensive Capture, and Hydrogen and Carriers.

This report includes economic impact analysis on the state of Texas, as well as 10 regions in Texas that aggregate all 254 counties:

Alamo: Atascosa, Bandera, Bexar, Calhoun, Comal, DeWitt, Frio, Gillespie, Goliad, Gonzales, Guadalupe, Jackson, Karnes, Kendall, Kerr, Lavaca, Medina, Victoria, Wilson

Capital: Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Llano, Travis, Williamson

Central: Bell, Bosque, Brazos, Burleson, Coryell, Falls, Freestone, Grimes, Hamilton, Hill, Lampasas, Leon, Limestone, Madison, McLennan, Milam, Mills, Robertson, San Saba, Washington

Gulf Coast: Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, Wharton

High Plains: Armstrong, Bailey, Briscoe, Carson, Castro, Childress, Cochran, Collingsworth, Crosby, Dallam, Deaf Smith, Dickens, Donley, Floyd, Garza, Gray, Hale, Hall, Hansford, Hartley, Hemphill, Hockley, Hutchinson, King, Lamb, Lipscomb, Lubbock, Lynn, Moore, Motley, Ochiltree, Oldham, Parmer, Potter, Randall, Roberts, Sherman, Swisher, Terry, Wheeler, Yoakum

Metroplex: Collin, Cooke, Dallas, Denton, Ellis, Erath, Fannin, Grayson, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, Wise

Northwest: Archer, Baylor, Brown, Callahan, Clay, Coleman, Comanche, Cottle, Eastland, Fisher, Foard, Hardeman, Haskell, Jack, Jones, Kent, Knox, Mitchell, Montague, Nolan, Runnels, Scurry, Shackelford, Stephens, Stonewall, Taylor, Throckmorton, Wichita, Wilbarger, Young

South: Aransas, Bee, Brooks, Cameron, Dimmit, Duval, Edwards, Hidalgo, Jim Hogg, Jim Wells, Kenedy, Kinney, Kleberg, La Salle, Live Oak, Maverick, McMullen, Nueces, Real, Refugio, San Patricio, Starr, Uvalde, Val Verde, Webb, Willacy, Zapata, Zavala

East: Angelina, Hardin, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Polk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler, Anderson, Bowie, Camp, Cass, Cherokee, Delta, Franklin, Gregg, Harrison, Henderson, Hopkins, Lamar, Marion, Morris, Panola, Rains, Red River, Rusk, Smith, Titus, Upshur, Van Zandt, Wood

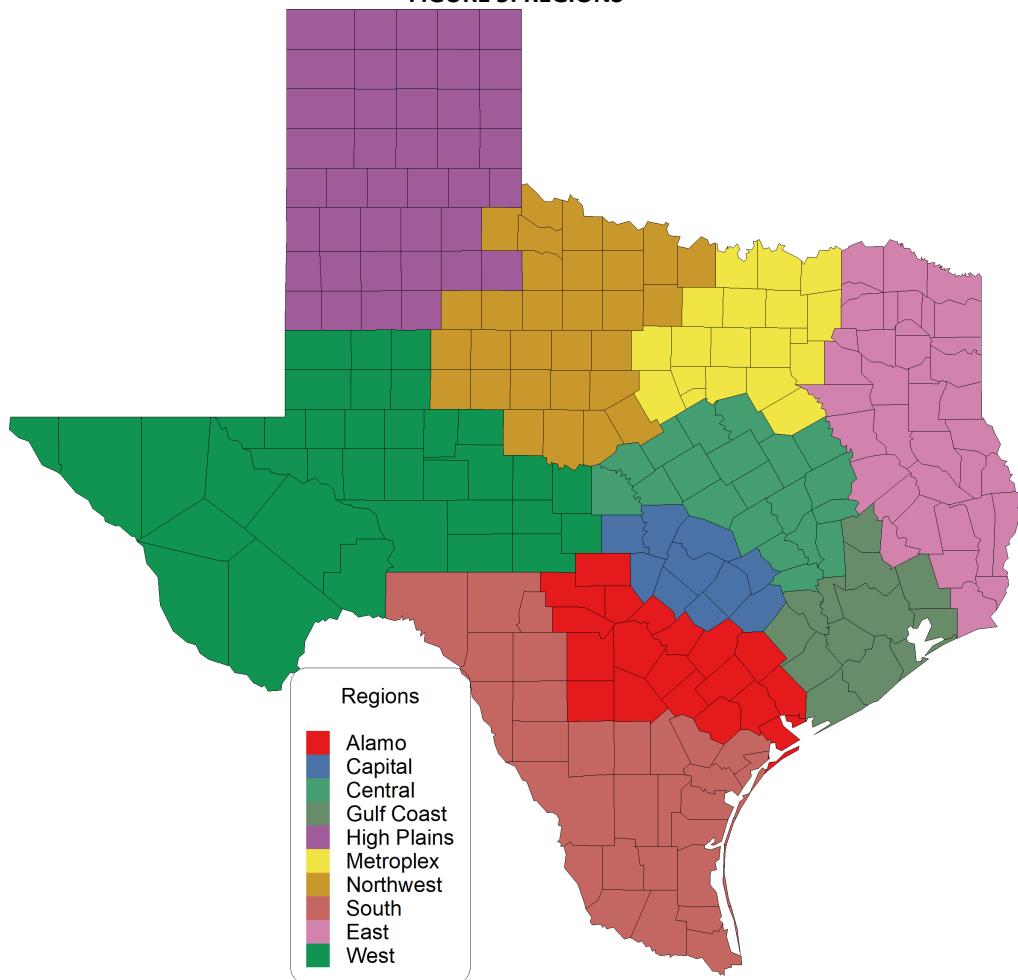
West: Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio, Andrews, Borden, Coke, Concho, Crane, Crockett, Dawson, Ector, Gaines, Glasscock, Howard, Irion, Kimble, Loving, Martin, Mason, McCulloch, Menard, Midland, Pecos, Reagan, Reeves, Schleicher, Sterling, Sutton, Terrell, Tom Green, Upton, Ward, Winkler

For each region, the Webber Energy Group provided changes in direct economic activity compared to BAU. The Business Research Division deferred to the model for local purchasing coefficients. The Webber Energy Group determined the scenarios examined in this study. Data were provided in fixed 2018 dollars, quantified in the year of expected impact. The economic impacts are presented in fixed, 2018 dollars and discounted by the model using industry price deflators.

Economic impact studies include the direct spending that a company or activity has on the area of study, as well as the indirect impact, which is the ripple effect that direct spending has on other businesses in the community. This term is also referred to as the *multiplier effect*, wherein companies utilize the local supply chain. A multiplier is a numeric way of describing the full effects of money changing hands within an economy. For instance, when a utility purchases natural gas, this affects the national mining and

transportation industries. This is the indirect impact. Additionally, spending by employees has an inherent effect on local communities as they purchase groceries, clothes, and gas; pay rent or a mortgage; get haircuts, etc. This is understood as the induced impact.

FIGURE 5: REGIONS

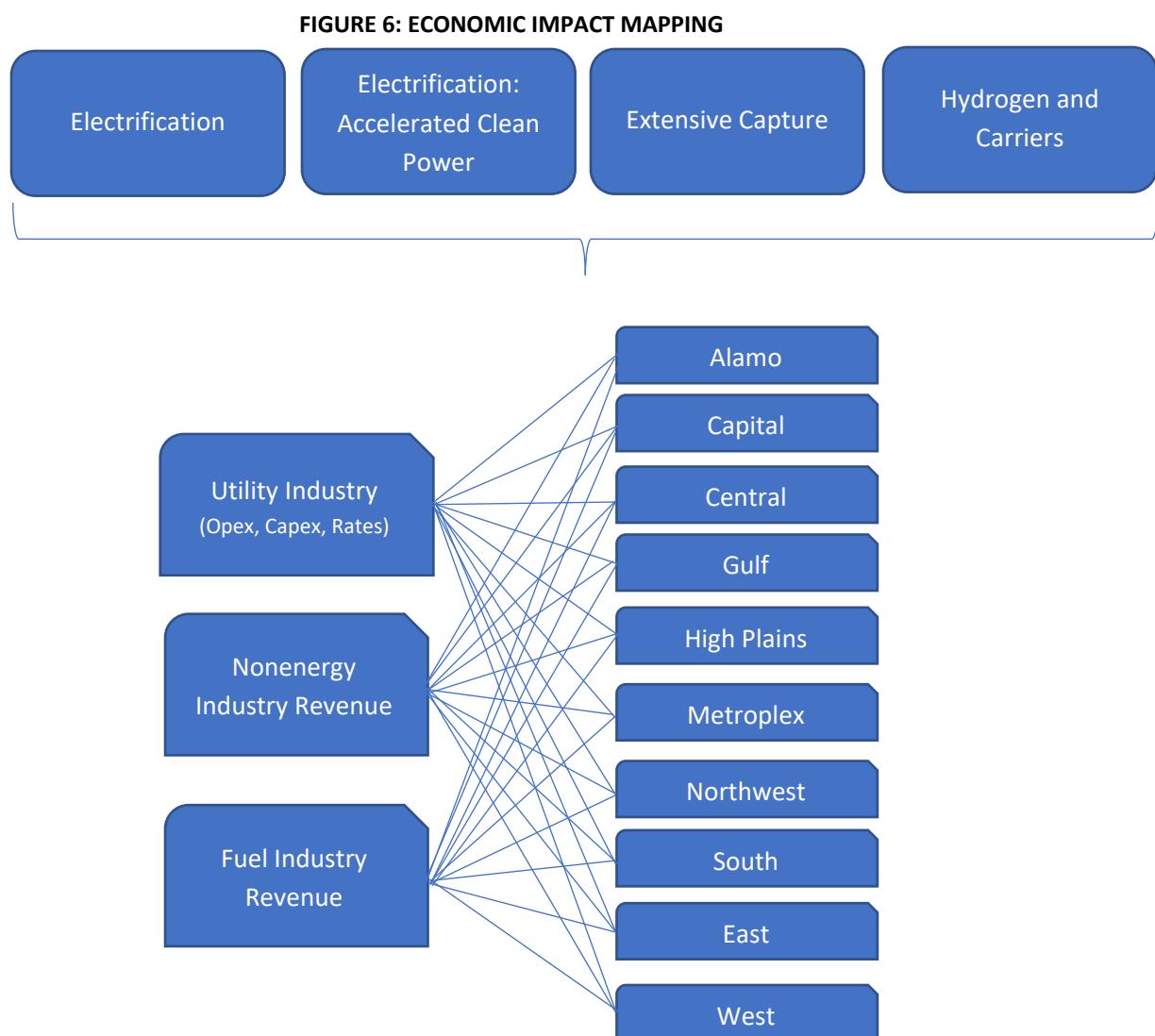


The research team used the REMI E3+ model 2.4.3 for the analysis.¹ Appendix 1 provides an overview of the REMI model. The REMI model is a dynamic forecasting and policy analysis model that incorporates econometric, input-output, and computable general equilibrium techniques. The model was created by REMI specifically for the state of Texas and ten regions that aggregate all 254 counties in the state using national and local economic and demographic data.

¹ Contracted by the University of Colorado from REMI, Inc. in 2020 and 2021.

Spending changes were entered into the REMI model based on total activity expenditures. For expenditures, a negative number reflects a decrease in spending under the alternative scenarios compared to the BAU. For customer rate changes, a negative number reflects lower energy costs to residential, industrial, commercial, and government customers. The researchers deferred to the model for the industry intermediate inputs and local purchasing coefficients for intermediate inputs, and for the proportion of spending devoted to capital and labor. The local purchasing coefficients within REMI change over time based on changing demand.

The impacts are displayed from three sources across ten regions in Texas.



THE TEXAS ECONOMY

The Texas Demographic Center estimated state population at 29 million in 2019.² By region, Metroplex (Dallas, Fort Worth) and Gulf Coast (Houston) comprised more than half of the total population in the state (52.3%).

TABLE 5: TEXAS POPULATION ESTIMATES, 2019

Region	Population	Share
Alamo	2,860,484	9.9%
Capital	2,350,295	8.1%
Central	1,237,614	4.3%
Gulf Coast	7,227,237	24.9%
High Plains	870,876	3.0%
Metroplex	7,944,904	27.4%
Northwest	554,535	1.9%
South	2,469,044	8.5%
East	1,949,403	6.7%
West	1,537,210	5.3%
Texas	29,001,602	100.0%

Source: Texas Demographic Center.

Data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) show the state recorded 12.1 million total nonfarm covered employees in 2020. Like population, most employment is clustered in two regions: Gulf Coast (2.9 million jobs, 24.3% of the state total) and Metroplex (3.6 million jobs, 29.9% of the state total). Following the last recession (2007–2009), Texas has outperformed in the employment recovery, recording the third-best employment growth from June 2009 through June 2021.

TABLE 6: TEXAS EMPLOYMENT, 2020

Region	Employment	Share
Alamo	1,100,260	9.1%
Capital	1,068,976	8.9%
Central	432,939	3.6%
Gulf Coast	2,936,699	24.3%
High Plains	360,135	3.0%
Metroplex	3,613,730	29.9%
Northwest	199,040	1.6%
South	795,453	6.6%
East	664,165	5.5%
West	588,116	4.9%
Unknown	309,924	2.6%
Texas	12,069,431	100.0%

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

² The most current data available as of July 2021.

Data from the Bureau of Economic Analysis show Texas's nominal GDP totaled of \$1.8 trillion in 2020, making it the 2nd-largest economy in the United States. Annual real GDP, adjusting for inflation, decreased 3.5% in 2020 due to the pandemic-induced recession, ranking the state 23rd for annual GDP change. The state's economy grew 0.8% year-over-year in Q1 2021.

TABLE 7: TEXAS NOMINAL GDP, 2019

Region	GDP (\$ thousands)	Share
Alamo	157,107,003	8.5%
Capital	164,777,394	8.9%
Central	57,123,894	3.1%
Gulf Coast	519,782,109	28.2%
High Plains	57,164,584	3.1%
Metroplex	541,281,543	29.4%
Northwest	26,299,459	1.4%
South	93,489,396	5.1%
East	93,446,456	5.1%
West	133,330,858	7.2%
Texas	1,843,802,699	100.0%

Source: Bureau of Economic Analysis.

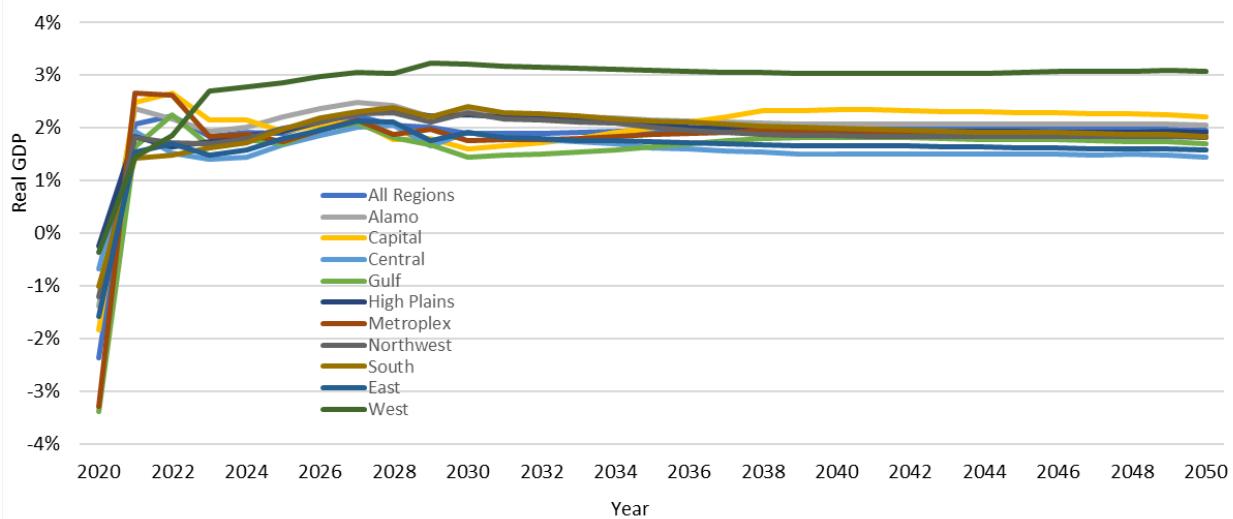
Per capita personal income for the state was \$52,813 in 2019. Per capita personal income varied widely in the individual counties in the state, with Midland County more than twice the state average, and Hudspeth County 55% below the state average. By region, the Capital region recorded the highest per capita personal income in the state, while the South region was the lowest in 2019.

TABLE 8: TEXAS NOMINAL PERSONAL INCOME, 2019

Region	Personal Income (\$ thousands)	Population	Per Capita Personal Income
Alamo	139,852,610	2,863,398	48,841
Capital	144,420,643	2,351,549	61,415
Central	52,249,784	1,238,101	42,202
Gulf Coast	422,843,865	7,238,804	58,413
High Plains	40,334,043	872,095	46,250
Metroplex	462,820,479	7,978,890	58,006
Northwest	25,307,677	550,497	45,972
South	80,706,970	2,441,728	33,053
East	83,304,154	1,933,904	43,076
West	79,506,233	1,526,915	52,070
Texas	1,531,346,458.00	28,995,881	52,813

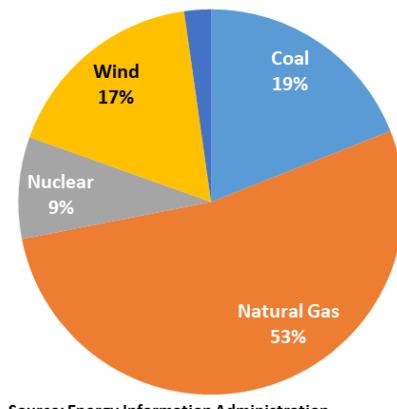
Source: Bureau of Economic Analysis.

The REMI baseline forecast places the U.S. economy on a growth trajectory after 2020 lasting throughout the analysis horizon. In the REMI model, most regions in Texas outperform national GDP growth throughout the horizon after 2022.

FIGURE 7: REMI BASELINE GDP FORECAST, 2020–2040

TEXAS ENERGY PRODUCTION AND CONSUMPTION

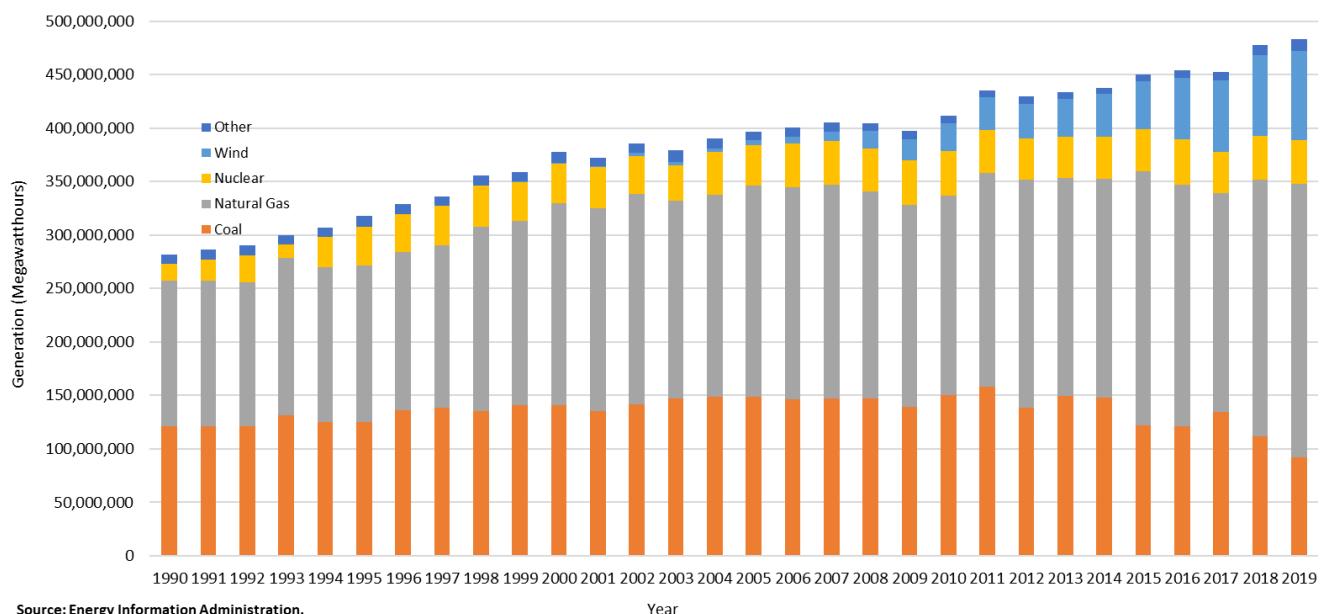
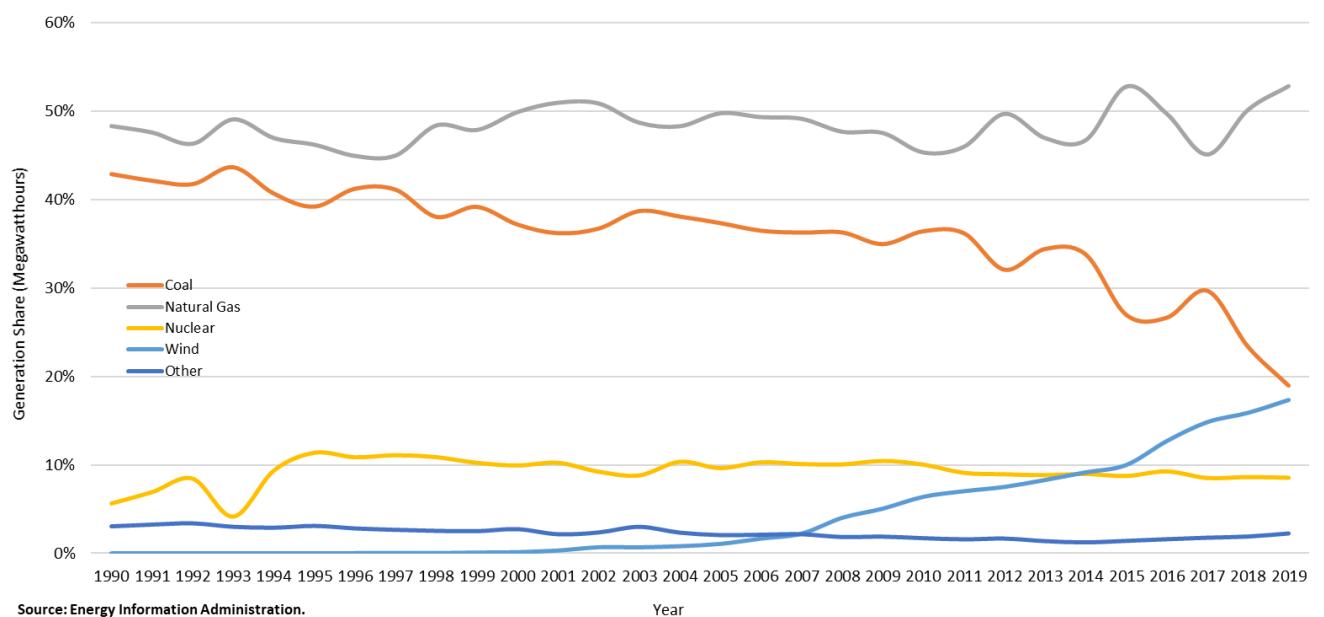
Texas ranks as the top state for energy production, particularly because of the rich natural resource extraction (i.e., natural gas, crude oil, coal): 1st for crude oil production, 1st for natural gas production, 9th for coal production, and 1st for electricity production.³ The state ranked 6th for total energy consumption per capita.⁴ As shown in Figure 3, approximately 53% of energy generated in the state came from natural gas, and an additional 19% was produced from coal in 2019.⁵ Texas ranked 1st in wind-generated electricity in 2019 and 5th for solar thermal and photovoltaic.

FIGURE 8: TEXAS ELECTRICITY GENERATION, SHARE OF MWH GENERATION, 2019

³ Energy Information Administration, Texas, U.S. Rankings, <https://www.eia.gov/state/?sid=TX>.

⁴ Energy Information Administration, Total Energy Consumed per Capita, 2019 (million Btu).

⁵ Energy Information Administration, Net Generation by State by Type of Producer by Energy Source, 1990–2019.

FIGURE 9: TEXAS ELECTRICITY GENERATION, GENERATION, 1990–2019**FIGURE 10: TEXAS ELECTRICITY GENERATION, SHARE OF GENERATION, 1990–2019**

ELECTRIFICATION ECONOMIC IMPACT

The Electrification scenario includes the decarbonization of the electric grid and other sectors of the economy (e.g., transportation, real estate, industry) by 2050. This scenario results in an average annual decrease in economic activity of \$13.8 billion compared to the BAU, and a decrease of 6,300 jobs. Updating the energy grid results in economic benefits to the state (\$25 billion, 168,000 jobs), as does additional spending in the nonenergy industries (\$12.9 billion, 91,000 jobs). However, decreases in fuel sector spending more than offset the other gains.

TABLE 9: ELECTRIFICATION, ECONOMIC IMPACT SUMMARY BY SOURCE, AVERAGE, 2021-2050

Source	Jobs	GDP (Ths, Fixed 2018 \$)
Energy Grid	168,401	25,298,840
Capital Investment	90,019	16,921,196
Fixed	106,477	13,614,972
Variable	(16,075)	(1,909,791)
Rates	(12,021)	(3,327,537)
Nonenergy Industry	91,286	12,923,722
Fuel Sector	(266,032)	(51,973,505)
Total	(6,345)	(13,750,943)

TABLE 10: ELECTRIFICATION, NET EMPLOYMENT IMPACTS, 2021-2050

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	196,964	151,482	(72,567)	(158,435)	(116,268)	(39,246)	(6,345)
Alamo	21,026	5,036	(6,085)	(16,218)	(15,482)	(8,807)	(3,422)
Capital	18,734	17,420	5,614	(3,204)	2,000	9,106	8,278
Central	5,468	4,836	(3,289)	(5,860)	(5,066)	(4,581)	(1,415)
Gulf	72,505	6,978	(92,975)	(131,345)	(125,130)	(110,350)	(63,386)
High Plains	2,408	21,022	742	714	6,898	9,881	6,944
Metroplex	62,119	59,353	26,496	17,849	32,700	61,495	43,335
Northwest	(980)	29,198	18,393	11,411	11,088	11,018	13,355
South	4,365	2,257	(9,408)	(12,579)	(8,955)	(4,123)	(4,740)
East	7,442	1,797	(1,878)	(8,907)	(5,531)	(701)	(1,296)
West	3,875	3,586	(10,179)	(10,295)	(8,790)	(2,185)	(3,998)

TABLE 11: ELECTRIFICATION, NET GDP IMPACTS, 2021-2050

	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	28,055	24,503	(19,838)	(36,800)	(41,518)	(36,907)	(13,751)
Alamo	3,030	610	(2,050)	(3,967)	(4,856)	(4,495)	(1,955)
Capital	3,121	1,857	383	(431)	319	1,524	1,129
Central	1,970	1,387	(1,269)	(979)	(1,569)	(2,479)	(490)
Gulf	9,223	1,254	(15,310)	(23,508)	(25,575)	(25,439)	(13,226)
High Plains	699	2,431	(1,803)	(760)	(1,050)	(2,123)	(434)
Metroplex	8,073	9,615	5,849	3,271	6,229	11,993	7,505
Northwest	(315)	5,092	1,292	1,058	(119)	(843)	1,027
South	784	784	(1,935)	(3,082)	(3,681)	(3,678)	(1,801)
East	1,484	19	(1,738)	(3,413)	(3,782)	(3,667)	(1,849)
West	(15)	1,454	(3,259)	(4,989)	(7,433)	(7,700)	(3,657)

In this scenario, the electric power sector incurs an increase in capital investment of \$462 billion, fixed operating costs of \$161 billion, and a decrease in variable costs of \$93 billion. Retail consumption spending (gross rates) increases by \$496 billion. Retirement costs increase modestly. Other fuel industry spending decreases by \$1.3 trillion, while nonenergy revenue increases by \$226 billion. Retail consumption spending (i.e., customer rate changes) increases the most in the South and Metroplex regions, but some regions experience a decrease in rates.

TABLE 12: ELECTRIFICATION, CHANGE IN SPENDING, \$ MILLIONS

	Sum, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions							
Rates	(6,689)	30,436	79,909	115,939	135,956	139,995	495,546
Variable	(7,657)	(20,427)	(18,826)	(14,966)	(15,742)	(15,868)	(93,486)
Fixed	4,694	18,844	27,934	32,813	37,448	39,141	160,875
Capital Investment	78,242	143,704	67,998	77,466	56,101	38,663	462,173
Retirement Costs	532	(280)	(92)	413	398	1,149	2,119
Fuel Industry Revenue	(21,620)	(81,840)	(177,791)	(278,600)	(360,375)	(428,782)	(1,349,009)
Nonenergy Industry Revenue	42,516	20,082	(12,484)	2,493	49,286	123,647	225,540

TABLE 13: ELECTRIFICATION, CHANGE IN UTILITY SECTOR SPENDING, 2021-2050, \$ MILLIONS

Region	Rates	Variable	Fixed	Capital Investment
All Regions	495,546	(93,486)	160,875	462,173
Alamo	(3,276)	(7,932)	6,676	17,348
Capital	(5,273)	(1,738)	8,040	17,975
Central	61,603	(32,327)	12,542	29,142
Gulf	20,374	(5,328)	7,238	29,369
High Plains	(13,517)	(7,789)	21,402	73,545
Metroplex	111,684	(1,809)	17,927	62,889
Northwest	(49,778)	(8,042)	35,162	78,684
South	229,069	(2,898)	24,073	72,064
East	58,791	(2,466)	10,230	25,282
West	85,869	(23,157)	17,586	55,876

The following subsections quantify the changes in spending and economic impacts derived from the utility industry, other nonenergy industries, and other energy industries.

Electrification Scenario Utility Sector Change

The increase in investment and operating expenditures in this scenario leads to net economic benefits in the state of Texas that average \$25 billion per year over the 30-year horizon and leads to a net increase in employment of 168,000 additional jobs compared to BAU, or a 0.5% deviation from BAU. The largest economic benefits are in the Metroplex and Gulf Coast regions—the two largest economies.

TABLE 14: ELECTRIFICATION, TEXAS UTILITY SECTOR ECONOMIC IMPACT (AVERAGE)

All Regions	Units	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
Total Employment	Individuals (Jobs)	150,384	250,192	187,888	139,569	139,718	142,656	168,401
Private Non-Farm Employment	Individuals (Jobs)	140,499	230,090	172,504	128,664	131,478	136,142	156,563
Residence Adjusted Employment	Individuals	146,376	244,977	184,919	137,596	137,508	140,605	165,330
Population	Individuals	103,748	249,409	279,870	227,573	190,602	174,693	204,316
Labor Force	Individuals	77,094	162,426	155,784	112,351	98,656	98,782	117,516
Gross Domestic Product	Ths, Fixed 2018 \$	23,745,794	41,442,704	26,014,023	23,375,048	19,799,878	17,415,591	25,298,840
Output	Ths, Fixed 2018 \$	34,601,466	61,237,620	37,875,772	32,561,891	27,309,513	24,109,877	36,282,690
Personal Income	Ths, Fixed 2018 \$	11,498,190	22,098,141	20,164,940	16,872,845	17,093,858	17,860,016	17,597,998
Disposable Personal Income	Ths, Fixed 2018 \$	10,506,969	20,038,861	18,362,701	15,402,997	15,571,255	16,246,569	16,021,558

TABLE 15: ELECTRIFICATION, TEXAS UTILITY SECTOR IMPACT ON EMPLOYMENT BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	150,384	250,192	187,888	139,569	139,718	142,656	168,401
Alamo	17,032	10,933	12,356	6,570	5,185	6,357	9,739
Capital	12,818	22,102	21,974	13,873	13,785	13,404	16,326
Central	3,469	6,168	2,321	837	159	(1,319)	1,940
Gulf	53,561	56,039	35,061	21,829	25,935	26,594	36,503
High Plains	1,682	23,004	5,867	6,402	10,960	11,742	9,943
Metroplex	47,240	74,981	72,270	61,785	53,465	49,898	59,940
Northwest	(1,136)	31,086	22,875	17,335	17,101	16,925	17,364
South	2,154	5,470	665	(495)	1,209	2,773	1,962
East	9,961	11,332	12,060	5,760	5,088	5,193	8,232
West	3,603	9,075	2,438	5,673	6,830	11,089	6,451

TABLE 16: ELECTRIFICATION, TEXAS UTILITY SECTOR IMPACT ON GDP BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	23,746	41,443	26,014	23,375	19,800	17,416	25,299
Alamo	2,712	1,821	1,546	1,221	916	1,095	1,552
Capital	2,550	2,587	2,612	1,942	1,898	1,811	2,233
Central	1,717	1,602	(208)	578	47	(898)	473
Gulf	7,307	9,018	5,520	4,096	4,700	4,861	5,917
High Plains	713	3,088	(165)	1,535	1,464	382	1,169
Metroplex	6,287	11,551	12,292	10,173	9,779	9,707	9,965
Northwest	(341)	5,350	2,023	2,163	1,161	582	1,823
South	689	1,552	182	(73)	(372)	(416)	260
East	1,801	1,565	1,249	510	219	101	908
West	311	3,310	963	1,231	(12)	190	999

Electrification Scenario Other Energy Industry and Nonenergy Industry Impacts

Additional economic impacts are derived from other energy industry impacts and nonenergy industry impacts, external from the power sector. Electrifying other nonenergy sectors lead to an increase in economic impacts as transportation, buildings, and other industries increase investment; however, the decrease in other energy production (e.g., drilling, extraction, transportation) leads to a decrease in economic activity from the energy industry.

FIGURE 11: ELECTRIFICATION SCENARIO, ENERGY INDUSTRY REVENUE CHANGE

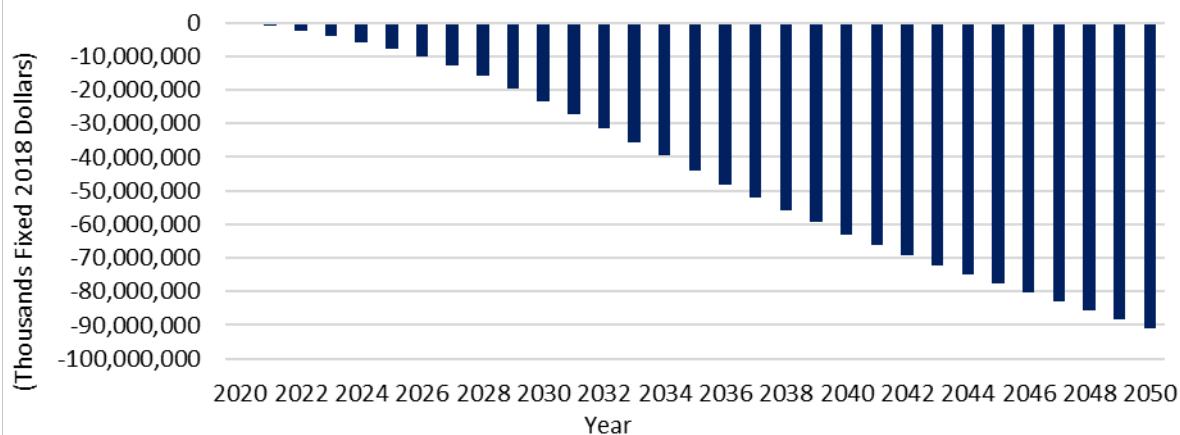


FIGURE 12: ELECTRIFICATION SCENARIO, NONENERGY INDUSTRY REVENUE CHANGE

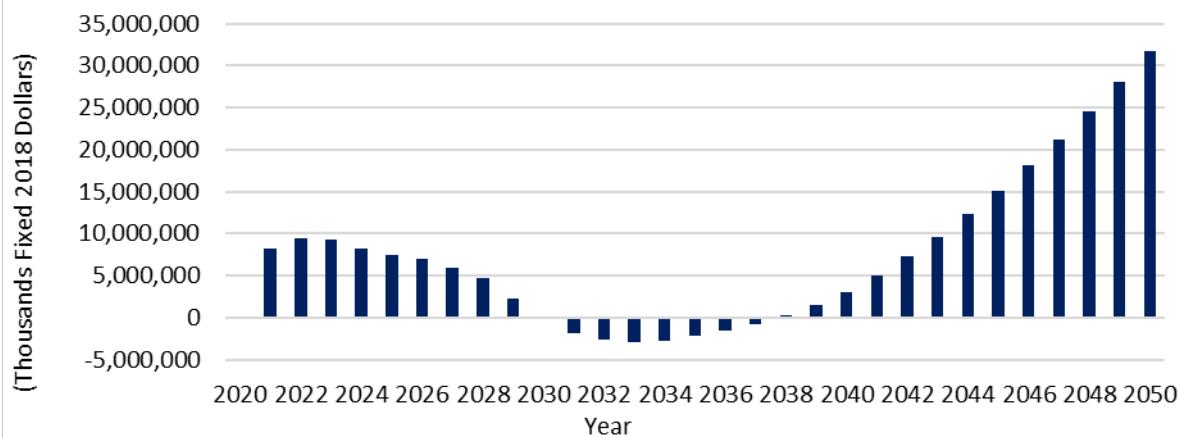


TABLE 17: ELECTRIFICATION, NONENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	85,024	37,158	(1,162)	54,115	137,357	235,222	91,286
Alamo	6,515	3,608	555	3,567	9,454	17,099	6,800
Capital	7,801	3,217	112	6,626	16,085	26,770	10,102
Central	2,525	1,397	657	2,739	5,742	9,018	3,680
Gulf	36,293	14,991	(8,262)	3,525	20,931	42,163	18,274
High Plains	1,516	1,237	1,379	3,202	5,636	8,209	3,530
Metroplex	20,446	7,726	1,713	21,909	53,545	92,113	32,909
Northwest	466	(323)	(960)	(829)	(329)	236	(290)
South	3,438	2,178	1,420	4,389	8,621	13,370	5,569
East	3,599	1,373	1,013	6,343	12,602	18,314	7,207
West	2,425	1,754	1,211	2,645	5,071	7,931	3,506

TABLE 18: ELECTRIFICATION, NONENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	9,354	3,881	(1,335)	6,240	20,138	39,265	12,924
Alamo	690	350	(139)	91	860	2,114	661
Capital	745	129	(259)	680	2,266	4,306	1,311
Central	278	186	79	313	727	1,260	474
Gulf	4,208	1,668	(1,445)	318	3,458	7,911	2,686
High Plains	149	107	78	289	629	1,064	386
Metroplex	2,369	992	208	3,204	8,866	16,833	5,412
Northwest	46	(38)	(125)	(131)	(78)	5	(54)
South	290	170	56	360	888	1,592	559
East	347	111	(3)	613	1,486	2,454	835
West	231	205	214	503	1,035	1,726	653

TABLE 19: ELECTRIFICATION, ENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(38,444)	(135,868)	(259,293)	(352,119)	(393,343)	(417,124)	(266,032)
Alamo	(2,521)	(9,505)	(18,995)	(26,356)	(30,121)	(32,263)	(19,960)
Capital	(1,885)	(7,899)	(16,472)	(23,703)	(27,870)	(31,068)	(18,150)
Central	(526)	(2,729)	(6,267)	(9,436)	(10,967)	(12,280)	(7,034)
Gulf	(17,349)	(64,052)	(119,774)	(156,699)	(171,996)	(179,107)	(118,163)
High Plains	(790)	(3,219)	(6,504)	(8,889)	(9,699)	(10,070)	(6,528)
Metroplex	(5,567)	(23,354)	(47,487)	(65,845)	(74,309)	(80,515)	(49,513)
Northwest	(309)	(1,566)	(3,522)	(5,095)	(5,684)	(6,143)	(3,720)
South	(1,226)	(5,392)	(11,492)	(16,472)	(18,785)	(20,265)	(12,272)
East	(6,117)	(10,909)	(14,952)	(21,010)	(23,220)	(24,208)	(16,736)
West	(2,153)	(7,244)	(13,828)	(18,613)	(20,692)	(21,205)	(13,956)

TABLE 20: ELECTRIFICATION, ENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(5,045)	(20,821)	(44,517)	(66,415)	(81,456)	(93,587)	(51,974)
Alamo	(372)	(1,561)	(3,457)	(5,279)	(6,633)	(7,704)	(4,168)
Capital	(174)	(859)	(1,969)	(3,052)	(3,845)	(4,592)	(2,415)
Central	(25)	(402)	(1,139)	(1,869)	(2,342)	(2,841)	(1,436)
Gulf	(2,292)	(9,433)	(19,385)	(27,922)	(33,733)	(38,211)	(21,829)
High Plains	(164)	(763)	(1,715)	(2,584)	(3,144)	(3,569)	(1,990)
Metroplex	(583)	(2,928)	(6,651)	(10,106)	(12,416)	(14,547)	(7,872)
Northwest	(20)	(220)	(606)	(974)	(1,201)	(1,430)	(742)
South	(195)	(937)	(2,174)	(3,369)	(4,197)	(4,854)	(2,621)
East	(665)	(1,657)	(2,984)	(4,536)	(5,488)	(6,222)	(3,592)
West	(557)	(2,061)	(4,436)	(6,723)	(8,456)	(9,617)	(5,308)

ELECTRIFICATION ACCELERATED CLEAN POWER ECONOMIC IMPACT

The Electrification Accelerated Clean Power scenario assumes the same conditions as the Electrification scenario, but accelerates the decarbonization of the grid to 2035. This scenario results in an average annual decrease in economic activity of \$14.9 billion compared to the BAU, and a decrease of 17,400 jobs. Updating the energy grid results in economic benefits to the state (\$26 billion, 170,000 jobs), as does additional spending in the nonenergy industries (\$12.2 billion, 84,900 jobs). However, decreases in fuel sector spending more than offset the other gains.

TABLE 21: ELECTRIFICATION ACCELERATED CLEAN POWER, ECONOMIC IMPACT SUMMARY BY SOURCE, AVERAGE, 2021-2050

Source	Jobs	GDP (Ths, Fixed 2018 \$)
Energy Grid	169,926	25,810,470
Capital Investment	103,461	19,454,164
Fixed	112,051	14,534,930
Variable	(15,000)	(1,774,124)
Rates	(30,585)	(6,404,498)
Nonenergy Industry	84,890	12,222,928
<u>Fuel Sector</u>	<u>(272,253)</u>	<u>(52,966,859)</u>
Total	(17,437)	(14,933,460)

TABLE 22: ELECTRIFICATION ACCELERATED CLEAN POWER, NET EMPLOYMENT IMPACTS, 2021-2050

	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	184,698	100,857	(1,734)	(186,371)	(149,581)	(52,489)	(17,437)
Alamo	20,336	1,735	9,158	(9,763)	(13,576)	(5,748)	357
Capital	16,715	11,180	25,078	(623)	2,978	11,560	11,148
Central	4,809	2,674	(1,183)	(14,911)	(12,967)	(11,313)	(5,482)
Gulf	69,463	(10,484)	(51,719)	(129,039)	(127,235)	(111,225)	(60,040)
High Plains	2,219	20,070	(2,730)	(2,375)	3,031	7,594	4,635
Metroplex	58,249	45,826	21,969	6,853	25,704	60,258	36,476
Northwest	(1,193)	28,484	9,916	2,612	2,251	5,219	7,881
South	3,827	3	(3,634)	(13,861)	(10,905)	(4,694)	(4,877)
East	6,384	(1,279)	2,601	(10,090)	(8,229)	(871)	(1,914)
West	3,890	2,648	(11,191)	(15,175)	(10,632)	(3,269)	(5,622)

TABLE 23: ELECTRIFICATION ACCELERATED CLEAN POWER, NET GDP IMPACTS, 2021-2050

All Regions	Average						2021-2050
	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	
All Regions	26,585	18,276	(3,246)	(42,141)	(48,061)	(41,014)	(14,933)
Alamo	2,954	232	1,986	(2,705)	(4,888)	(4,523)	(1,157)
Capital	2,880	1,125	5,214	404	320	1,523	1,911
Central	1,861	1,056	(313)	(3,127)	(3,108)	(4,019)	(1,275)
Gulf	8,883	(885)	(8,151)	(22,226)	(26,642)	(26,318)	(12,557)
High Plains	675	2,309	(2,198)	(2,060)	(1,964)	(2,209)	(908)
Metroplex	7,569	7,847	4,429	1,840	5,209	11,277	6,362
Northwest	(353)	4,978	491	(907)	(1,495)	(1,135)	263
South	731	560	(1,078)	(3,513)	(4,192)	(4,097)	(1,931)
East	1,356	(359)	645	(3,031)	(4,285)	(4,072)	(1,625)
West	30	1,413	(4,273)	(6,816)	(7,017)	(7,441)	(4,017)

In this scenario, the electric power sector incurs an increase in capital investment of \$492 billion, fixed operating costs of \$171 billion, and a decrease in variable costs of \$111 billion. Retail consumption spending (gross rates) increases by \$515 billion. Retirement costs increase modestly. Other fuel industry revenue decreases by \$1.4 trillion, while nonenergy revenue increases by \$204 billion. Retail consumption spending (i.e., customer rate changes) increases the most in the South and Metroplex regions, but the Northwest region experiences a decrease in rates.

TABLE 24: ELECTRIFICATION ACCELERATED CLEAN POWER, CHANGE IN SPENDING, \$ MILLIONS

	Sum, \$ Millions						2021-2050
	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	
All Regions							
Rates	(6,688)	30,435	90,868	124,280	135,899	140,333	515,126
Variable	(7,657)	(20,427)	(25,447)	(22,165)	(18,715)	(17,022)	(111,433)
Fixed	4,694	18,844	31,235	36,252	38,870	40,823	170,718
Capital Investment	78,242	143,704	141,578	62,612	39,691	26,032	491,859
Retirement Costs	532	(280)	1,029	5,896	7,832	6,781	21,791
Fuel Industry Revenue	(21,921)	(83,812)	(180,420)	(281,180)	(362,588)	(431,049)	(1,360,970)
Nonenergy Industry Revenue	37,973	(673)	(19,530)	2,100	53,146	130,786	203,802

**TABLE 25: ELECTRIFICATION ACCELERATED CLEAN POWER, CHANGE IN UTILITY SECTOR SPENDING,
2021-2050, \$ MILLIONS**

Region	Rates	Variable	Fixed	Capital Investment
All Regions	515,126	(111,433)	170,718	491,859
Alamo	4,151	(10,468)	12,885	35,935
Capital	10,700	(2,853)	15,250	42,454
Central	74,145	(41,950)	7,000	17,720
Gulf	32,118	(6,697)	11,715	36,962
High Plains	10,814	(8,857)	37,015	111,870
Metroplex	97,860	(1,882)	13,741	52,140
Northwest	(46,679)	(10,036)	32,448	73,544
South	187,090	(2,336)	18,101	51,238
East	67,283	(3,449)	9,978	25,782
West	77,644	(22,905)	12,584	44,213

The following subsections quantify the changes in spending and economic impacts derived from the utility industry, other nonenergy industries, and other energy industries.

Electrification Accelerated Clean Power Scenario Utility Sector Change

The increase in investment and operating expenditures in this scenario leads to net economic benefits in the state of Texas that average \$26 billion per year over the 30-year horizon and leads to a net increase in employment of 170,000 additional jobs compared to BAU, or a 0.5% deviation from BAU. The largest economic benefits are in the Metroplex and Gulf Coast regions—the two largest economies.

**TABLE 26: ELECTRIFICATION ACCELERATED CLEAN POWER, TEXAS UTILITY SECTOR ECONOMIC IMPACT
(AVERAGE)**

All Regions	Units	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
Total Employment	Individuals (Jobs)	150,398	250,201	275,664	114,453	104,496	124,347	169,926
Private Non-Farm Employment	Individuals (Jobs)	140,511	230,098	254,063	105,107	100,569	121,447	158,632
Residence Adjusted Employment	Individuals	146,390	244,986	268,957	112,180	102,094	121,346	165,992
Population	Individuals	103,756	249,422	337,181	247,144	157,847	128,547	203,983
Labor Force	Individuals	77,100	162,434	197,232	115,868	72,905	74,259	116,633
Gross Domestic Product	Ths, Fixed 2018 \$	23,749,100	41,444,275	45,125,255	18,778,774	13,173,428	12,591,991	25,810,470
Output	Ths, Fixed 2018 \$	34,608,680	61,240,770	61,565,119	21,248,710	14,460,955	14,607,222	34,621,909
Personal Income	Ths, Fixed 2018 \$	11,499,111	22,098,982	30,393,587	17,211,867	14,562,466	16,092,394	18,643,068
Disposable Personal Income	Ths, Fixed 2018 \$	10,507,806	20,039,626	27,576,390	15,760,577	13,309,788	14,623,138	16,969,554

TABLE 27: ELECTRIFICATION ACCELERATED CLEAN POWER, TEXAS UTILITY SECTOR IMPACT ON EMPLOYMENT BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	150,398	250,201	275,664	114,453	104,496	124,347	169,926
Alamo	17,032	10,934	28,828	13,132	6,678	8,664	14,211
Capital	12,819	22,103	43,624	17,000	14,856	15,634	21,006
Central	3,469	6,169	5,366	(8,023)	(7,695)	(8,097)	(1,468)
Gulf	53,562	56,040	81,516	26,409	24,979	26,194	44,783
High Plains	1,690	23,004	2,850	3,325	6,968	9,258	7,849
Metroplex	47,242	74,984	71,733	50,170	44,193	45,061	55,564
Northwest	(1,136)	31,089	14,753	8,587	8,280	11,125	12,116
South	2,154	5,470	7,348	(1,682)	(918)	1,865	2,373
East	9,961	11,332	17,795	4,671	2,263	4,810	8,472
West	3,604	9,077	1,851	865	4,893	9,833	5,021

TABLE 28: ELECTRIFICATION ACCELERATED CLEAN POWER, TEXAS UTILITY SECTOR IMPACT ON GDP BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	23,749	41,444	45,125	18,779	13,173	12,592	25,810
Alamo	2,712	1,821	5,760	2,525	839	956	2,436
Capital	2,550	2,587	7,728	2,864	1,925	1,785	3,240
Central	1,717	1,603	926	(1,493)	(1,429)	(2,383)	(176)
Gulf	7,307	9,018	13,383	5,743	3,790	3,995	7,206
High Plains	716	3,088	(482)	265	560	295	740
Metroplex	6,287	11,551	11,536	8,743	8,435	8,374	9,154
Northwest	(341)	5,350	1,289	225	(191)	313	1,108
South	689	1,552	1,149	(474)	(885)	(859)	195
East	1,801	1,565	3,841	969	(239)	(275)	1,277
West	311	3,310	(5)	(589)	369	392	631

Electrification Accelerated Clean Power Scenario Other Energy Industry and Nonenergy Industry Impacts

Additional economic impacts are derived from other energy industry impacts and nonenergy industry impacts, external from the power sector. Electrifying other nonenergy sectors lead to an increase in economic impacts as transportation, buildings, and other industries increase investment; however, the decrease in other energy production (e.g., drilling, extraction, transportation) leads to a decrease in economic activity from the energy industry.

FIGURE 13: ELECTRIFICATION: ACCELERATED CLEAN POWER SCENARIO, ENERGY INDUSTRY REVENUE CHANGE

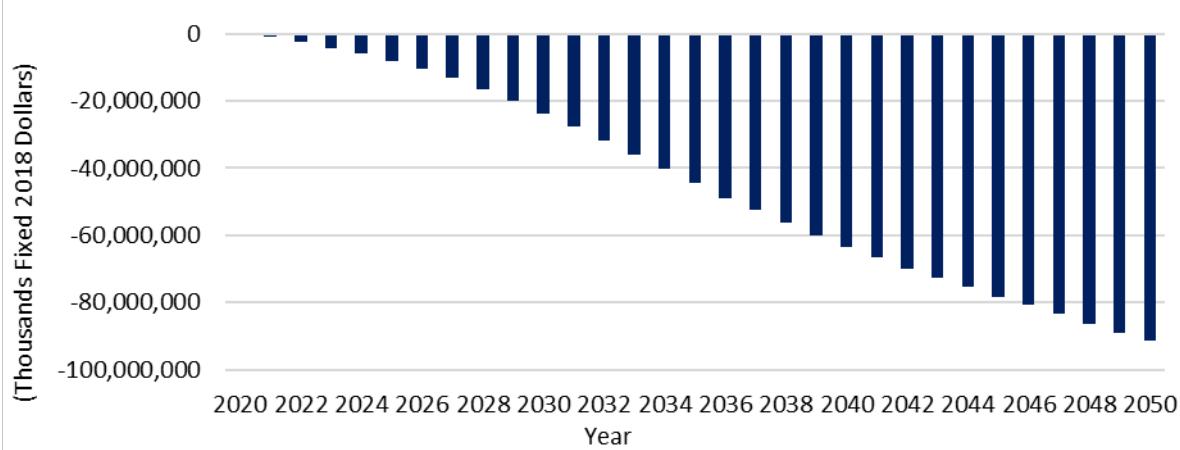


FIGURE 14: ELECTRIFICATION: ACCELERATED CLEAN POWER SCENARIO, NONENERGY INDUSTRY REVENUE CHANGE

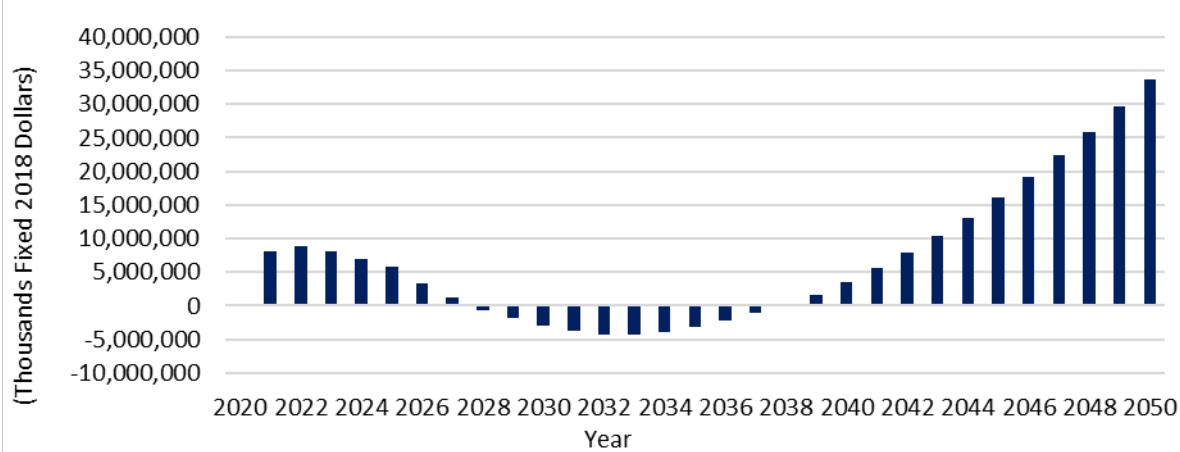


TABLE 29: ELECTRIFICATION ACCELERATED CLEAN POWER, NONENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	75,199	(3,913)	(9,675)	56,734	144,702	246,293	84,890
Alamo	5,869	750	(165)	3,810	10,183	18,196	6,441
Capital	6,048	(2,049)	(1,196)	6,668	16,607	27,673	8,958
Central	2,200	117	334	2,902	6,078	9,471	3,517
Gulf	33,256	(913)	(11,455)	2,730	21,056	43,129	14,634
High Plains	1,435	647	1,199	3,346	5,926	8,586	3,523
Metroplex	17,609	(2,661)	124	24,021	57,465	97,533	32,349
Northwest	410	(613)	(1,024)	(723)	(172)	427	(283)
South	3,167	701	1,080	4,615	9,135	14,068	5,461
East	2,902	(712)	430	6,608	13,128	18,969	6,888
West	2,304	818	998	2,755	5,296	8,241	3,402

TABLE 30: ELECTRIFICATION ACCELERATED CLEAN POWER, NONENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	8,239	(991)	(2,573)	6,441	21,172	41,050	12,223
Alamo	618	29	(243)	109	958	2,283	626
Capital	545	(466)	(425)	677	2,334	4,441	1,184
Central	245	43	29	317	756	1,309	450
Gulf	3,850	(326)	(1,895)	176	3,490	8,105	2,233
High Plains	143	48	53	297	658	1,108	385
Metroplex	2,027	(305)	(83)	3,458	9,481	17,789	5,394
Northwest	42	(64)	(132)	(120)	(60)	31	(51)
South	266	38	25	383	945	1,675	555
East	281	(102)	(89)	618	1,531	2,524	794
West	222	113	187	527	1,078	1,785	652

TABLE 31: ELECTRIFICATION ACCELERATED CLEAN POWER, ENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(40,900)	(145,431)	(267,723)	(357,558)	(398,779)	(423,128)	(272,253)
Alamo	(2,565)	(9,948)	(19,504)	(26,705)	(30,436)	(32,608)	(20,295)
Capital	(2,152)	(8,874)	(17,350)	(24,291)	(28,486)	(31,747)	(18,817)
Central	(860)	(3,612)	(6,884)	(9,790)	(11,350)	(12,687)	(7,531)
Gulf	(17,355)	(65,611)	(121,781)	(158,179)	(173,270)	(180,547)	(119,457)
High Plains	(906)	(3,581)	(6,779)	(9,046)	(9,863)	(10,250)	(6,738)
Metroplex	(6,603)	(26,497)	(49,888)	(67,337)	(75,953)	(82,336)	(51,436)
Northwest	(467)	(1,992)	(3,813)	(5,251)	(5,857)	(6,333)	(3,952)
South	(1,495)	(6,169)	(12,061)	(16,795)	(19,123)	(20,626)	(12,711)
East	(6,480)	(11,900)	(15,623)	(21,369)	(23,621)	(24,651)	(17,274)
West	(2,018)	(7,248)	(14,041)	(18,795)	(20,821)	(21,344)	(14,044)

TABLE 32: ELECTRIFICATION ACCELERATED CLEAN POWER, ENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(5,402)	(22,176)	(45,798)	(67,361)	(82,407)	(94,656)	(52,967)
Alamo	(375)	(1,618)	(3,532)	(5,339)	(6,686)	(7,762)	(4,218)
Capital	(216)	(996)	(2,089)	(3,137)	(3,939)	(4,703)	(2,513)
Central	(101)	(589)	(1,268)	(1,951)	(2,435)	(2,945)	(1,548)
Gulf	(2,274)	(9,578)	(19,639)	(28,145)	(33,921)	(38,418)	(21,996)
High Plains	(184)	(827)	(1,769)	(2,623)	(3,182)	(3,612)	(2,033)
Metroplex	(746)	(3,399)	(7,023)	(10,361)	(12,707)	(14,885)	(8,187)
Northwest	(55)	(308)	(666)	(1,012)	(1,244)	(1,479)	(794)
South	(224)	(1,029)	(2,251)	(3,422)	(4,252)	(4,913)	(2,682)
East	(727)	(1,823)	(3,107)	(4,618)	(5,577)	(6,322)	(3,696)
West	(502)	(2,010)	(4,455)	(6,754)	(8,464)	(9,618)	(5,300)

EXTENSIVE CAPTURE ECONOMIC IMPACT

The Extensive Capture scenario leverages carbon capture utilization and sequestration or direct air capture (DAC). This scenario results in an average annual increase in economic activity of \$34.3 billion compared to the BAU, and an increase of 204,000 jobs. Updating the energy grid results in economic benefits to the state (\$40.6 billion, 248,000 jobs), but the change in spending in the nonenergy industries has a mixed impact on GDP and jobs (\$975 million, -3,300 jobs). Decreases in fuel sector spending reduce jobs and economic activity in the state.

TABLE 33: EXTENSIVE CAPTURE, ECONOMIC IMPACT SUMMARY BY SOURCE, AVERAGE, 2021-2050

Source	Jobs	GDP (Ths, Fixed 2018 \$)
Energy Grid	248,063	40,559,825
Capital Investment	98,746	21,418,641
Fixed	133,291	16,953,661
Variable	(23,281)	(2,829,539)
Rates	39,308	5,017,061
Nonenergy Industry	(3,299)	974,957
<u>Fuel Sector</u>	<u>(40,704)</u>	<u>(7,185,044)</u>
Total	204,061	34,349,738

In this scenario, the electric power sector incurs an increase in capital investment of \$681 billion, fixed operating costs of \$208 billion, and a decrease in variable costs of \$125 billion. Retail consumption spending (gross rates) increases by \$709 billion. Retirement costs increase modestly. Other fuel industry revenue decreases by \$115 billion, while nonenergy revenue decreases by \$97 billion. Retail consumption spending (i.e., customer rate changes) increase the most in the South and Metroplex regions, but some regions experience a decrease in rates.

TABLE 34: EXTENSIVE CAPTURE, CHANGE IN SPENDING, \$ MILLIONS

	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	Sum, \$ Millions
							2021- 2050
All Regions							
Rates	(13,512)	20,944	87,013	153,720	206,935	254,095	709,194
Variable	(10,118)	(24,960)	(24,732)	(21,294)	(21,785)	(21,772)	(124,662)
Fixed	3,888	18,044	30,276	40,857	52,646	62,383	208,095
Capital Investment	63,105	142,440	92,486	133,446	124,435	124,864	680,776
Retirement Costs	904	155	46	2,508	3,577	2,953	10,143
Fuel Industry Revenue	(50)	(2,398)	(12,769)	(22,575)	(32,863)	(43,880)	(114,536)
Nonenergy Industry Revenue	(177)	(15,029)	(53,923)	(47,319)	(19,087)	38,714	(96,821)

TABLE 35: EXTENSIVE CAPTURE, CHANGE IN UTILITY SECTOR SPENDING, 2021-2050, \$ MILLIONS

Region	Rates	Variable	Fixed	Capital Investment
All Regions	709,194	(124,662)	208,095	680,776
Alamo	(28,703)	(11,878)	4,806	10,033
Capital	(22,642)	(4,789)	5,833	9,804
Central	64,327	(39,167)	13,736	33,315
Gulf	4,228	(8,869)	3,877	22,891
High Plains	(76,578)	(13,224)	12,497	42,987
Metroplex	252,179	(1,930)	49,030	186,859
Northwest	(89,548)	(11,962)	26,727	61,715
South	410,396	(3,142)	46,036	163,130
East	48,652	(4,795)	11,328	26,981
West	146,882	(24,905)	34,225	123,062

TABLE 36: EXTENSIVE CAPTURE, NET EMPLOYMENT IMPACTS, 2021-2050

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	93,933	218,463	146,696	147,847	223,581	332,747	193,878
Alamo	11,464	11,627	9,286	9,565	16,976	27,897	14,469
Capital	5,995	14,820	10,636	8,896	16,919	26,895	14,027
Central	2,028	3,475	1,435	(3,316)	(1,448)	1,210	564
Gulf	37,417	39,098	(7,391)	(18,537)	(12,362)	(8,510)	4,953
High Plains	757	26,736	23,865	30,757	51,577	58,334	32,004
Metroplex	28,426	67,545	59,695	77,469	96,207	141,799	78,523
Northwest	(850)	30,267	44,762	37,899	36,801	48,513	32,899
South	(305)	3,960	(1,971)	(1,236)	2,374	10,323	2,191
East	6,577	8,191	1,631	(4,236)	(3,406)	1,421	1,696
West	2,424	12,743	4,748	10,586	19,943	24,866	12,552

TABLE 37: EXTENSIVE CAPTURE, NET GDP IMPACTS, 2021-2050

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	15,347	35,042	22,580	28,018	38,840	56,073	32,650
Alamo	1,794	1,639	1,186	1,514	2,987	5,329	2,408
Capital	1,470	1,820	1,030	1,231	2,616	4,539	2,118
Central	1,254	1,000	318	(635)	(249)	(846)	140
Gulf	5,073	5,812	(956)	(1,756)	(375)	1,122	1,487
High Plains	488	3,723	3,260	6,658	9,712	7,514	5,226
Metroplex	3,915	9,672	9,960	13,738	18,198	28,116	13,933
Northwest	(281)	4,861	6,476	5,685	3,562	7,137	4,573
South	272	1,118	(87)	(259)	(805)	665	151
East	1,197	900	(345)	(1,323)	(1,460)	(822)	(309)
West	166	4,496	1,736	3,164	4,655	3,318	2,923

The following subsections quantify the changes in spending and economic impacts derived from the utility industry, other nonenergy industries, and other energy industries.

Extensive Capture Scenario Utility Sector Change

The increase in investment and operating expenditures in this scenario leads to net economic benefits in the state of Texas that average \$41 billion per year over the 30-year horizon and leads to a net increase in employment of 248,000 additional jobs compared to BAU, or a 1.1%-1.4% deviation from BAU. The largest economic benefits are in the Metroplex and Gulf Coast regions—the two largest economies.

TABLE 38: EXTENSIVE CAPTURE, TEXAS UTILITY SECTOR ECONOMIC IMPACT (AVERAGE)

All Regions	Units	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
Total Employment	Individuals (Jobs)	121,504	274,192	248,425	252,340	277,579	314,341	248,063
Private Non-Farm Employment	Individuals (Jobs)	113,728	253,533	226,959	230,807	255,646	290,972	228,608
Residence Adjusted Employment	Individuals	119,190	270,287	247,630	252,034	277,356	313,975	246,745
Population	Individuals	88,147	263,571	352,744	372,051	400,373	437,584	319,078
Labor Force	Individuals	65,364	174,624	203,602	198,936	215,812	241,493	183,305
Gross Domestic Product	Ths, Fixed 2018 \$	19,725,925	43,304,730	36,532,744	44,917,269	47,120,350	51,757,932	40,559,825
Output	Ths, Fixed 2018 \$	27,279,170	64,162,650	54,145,867	65,971,780	70,793,474	79,853,408	60,367,725
Personal Income	Ths, Fixed 2018 \$	8,950,484	22,794,909	23,855,872	26,131,051	30,517,405	36,274,593	24,754,052
Disposable Personal Income	Ths, Fixed 2018 \$	8,182,217	20,657,215	21,700,851	23,801,127	27,786,344	32,999,196	22,521,158

TABLE 39: EXTENSIVE CAPTURE, TEXAS UTILITY SECTOR IMPACT ON EMPLOYMENT BY REGION (AVERAGE)

All Regions	Average						
	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
All Regions	121,504	274,192	248,425	252,340	277,579	314,341	248,063
Alamo	14,902	12,887	13,561	11,808	12,444	15,183	13,464
Capital	8,027	20,390	22,002	19,214	22,504	24,861	19,500
Central	2,752	4,628	5,705	879	2,722	2,803	3,248
Gulf	45,569	54,090	39,302	40,499	48,602	47,610	45,945
High Plains	1,489	32,257	23,241	35,860	53,508	53,623	33,330
Metroplex	38,742	78,454	81,748	78,902	69,368	75,977	70,532
Northwest	(1,266)	38,141	46,420	40,523	37,072	52,789	35,613
South	172	6,210	1,237	2,156	2,208	7,150	3,189
East	8,172	11,245	10,483	6,889	6,644	9,641	8,846
West	2,945	15,888	4,726	15,608	22,508	24,704	14,397

TABLE 40: EXTENSIVE CAPTURE, TEXAS UTILITY SECTOR IMPACT ON GDP BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	19,726	43,305	36,533	44,917	47,120	51,758	40,560
Alamo	2,312	1,745	1,769	1,928	2,381	3,287	2,237
Capital	1,897	2,306	2,512	2,665	3,267	3,941	2,765
Central	1,582	1,015	1,028	260	997	(60)	804
Gulf	6,271	8,050	5,580	7,302	9,211	10,132	7,758
High Plains	650	4,456	3,432	8,190	10,449	6,777	5,659
Metroplex	5,302	11,325	12,980	13,419	12,377	14,086	11,582
Northwest	(368)	6,181	6,784	5,946	3,324	8,461	5,055
South	387	1,474	332	515	(447)	1,179	573
East	1,495	1,181	951	536	615	1,300	1,013
West	197	5,571	1,167	4,156	4,946	2,656	3,115

Extensive Capture Scenario Other Energy Industry and Nonenergy Industry Impacts

Additional economic impacts are derived from other energy industry impacts and nonenergy industry impacts, external from the power sector. Electrifying other nonenergy sectors lead to a decrease in economic impacts as transportation, buildings, and other industries increase investment. The decrease in other energy production (e.g., drilling, extraction, transportation) also leads to a decrease in economic activity from the energy industry.

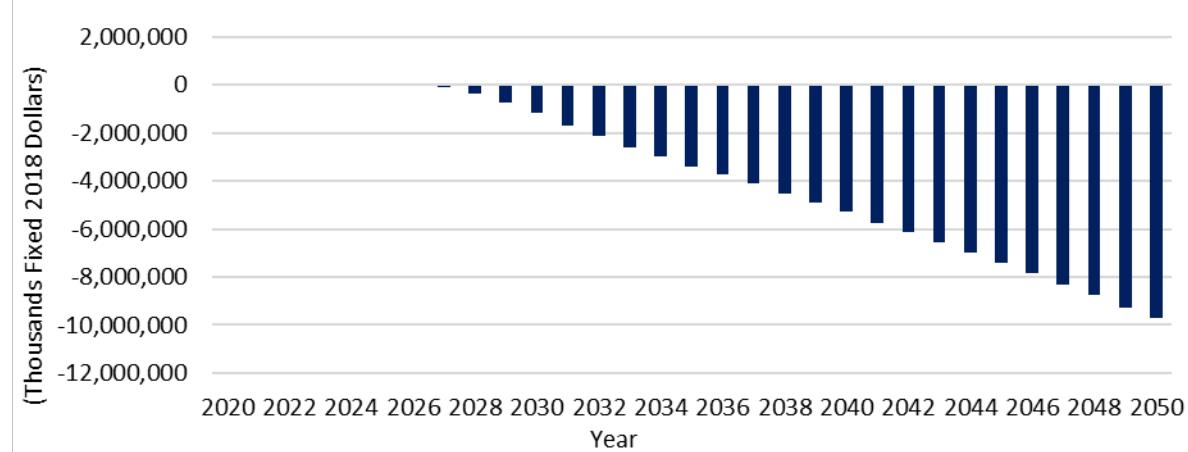
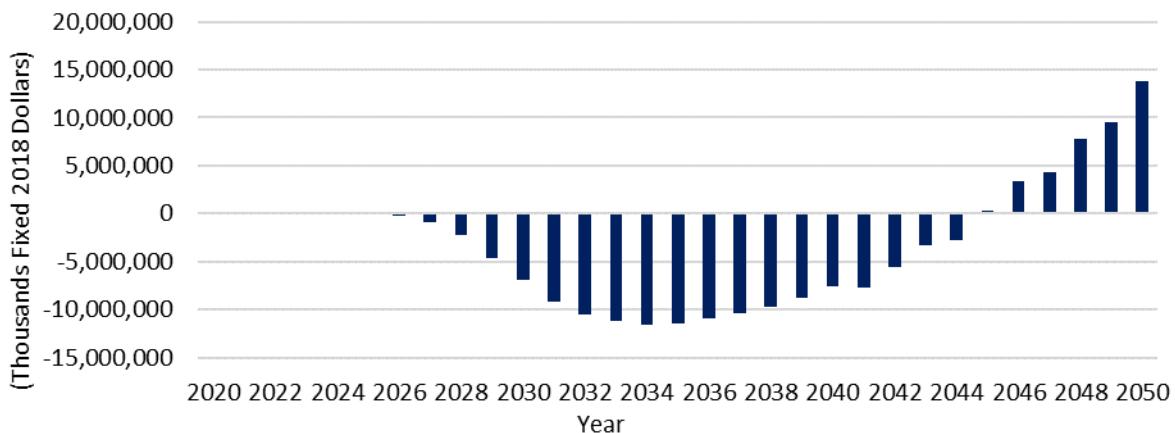
FIGURE 15: EXTENSIVE CAPTURE, ENERGY INDUSTRY REVENUE CHANGE

FIGURE 16: EXTENSIVE CAPTURE, NONENERGY INDUSTRY REVENUE CHANGE**TABLE 41: EXTENSIVE CAPTURE, NONENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)**

	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(202)	(25,856)	(82,013)	(43,097)	20,609	110,767	(3,299)
Alamo	(9)	(1,293)	(3,419)	1,482	8,985	18,887	4,105
Capital	0	(2,535)	(9,572)	(5,578)	1,536	10,506	(940)
Central	(11)	(792)	(2,603)	(1,596)	400	3,169	(239)
Gulf	(42)	(12,081)	(42,269)	(42,172)	(40,628)	(32,504)	(28,283)
High Plains	(11)	(289)	(450)	1,252	3,679	6,676	1,809
Metroplex	(56)	(5,386)	(12,453)	10,213	44,799	90,620	21,289
Northwest	(6)	(164)	(436)	37	870	1,975	379
South	(6)	(897)	(2,292)	409	4,356	9,369	1,823
East	(57)	(2,016)	(7,394)	(7,043)	(4,756)	(1,396)	(3,777)
West	(5)	(402)	(1,126)	(100)	1,368	3,466	533

TABLE 42: EXTENSIVE CAPTURE, NONENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(27)	(3,329)	(10,849)	(5,764)	4,555	21,265	975
Alamo	(1)	(152)	(401)	271	1,488	3,302	751
Capital	(0)	(313)	(1,199)	(642)	480	2,054	63
Central	(1)	(93)	(329)	(270)	(71)	278	(81)
Gulf	(6)	(1,678)	(6,039)	(6,400)	(6,380)	(5,050)	(4,259)
High Plains	(1)	(61)	(163)	(40)	205	582	87
Metroplex	(7)	(621)	(1,297)	2,447	9,022	18,706	4,708
Northwest	(0)	(15)	(28)	46	181	377	93
South	(1)	(115)	(356)	(192)	161	722	37
East	(7)	(252)	(971)	(1,090)	(947)	(598)	(644)
West	(2)	(29)	(68)	104	417	892	219

TABLE 43: EXTENSIVE CAPTURE, ENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(90)	(5,163)	(31,692)	(52,706)	(69,281)	(85,290)	(40,704)
Alamo	(5)	(327)	(1,980)	(3,322)	(4,398)	(5,439)	(2,579)
Capital	(5)	(395)	(2,633)	(4,651)	(6,407)	(8,197)	(3,715)
Central	(3)	(267)	(1,833)	(3,084)	(4,002)	(4,820)	(2,335)
Gulf	(44)	(1,662)	(9,140)	(14,935)	(19,511)	(24,091)	(11,564)
High Plains	(2)	(165)	(1,060)	(1,743)	(2,230)	(2,662)	(1,310)
Metroplex	(17)	(1,314)	(8,409)	(14,013)	(18,581)	(23,100)	(10,906)
Northwest	(1)	(150)	(1,008)	(1,656)	(2,125)	(2,537)	(1,246)
South	(4)	(300)	(1,976)	(3,306)	(4,260)	(5,102)	(2,491)
East	(5)	(376)	(2,484)	(4,072)	(5,202)	(6,204)	(3,057)
West	(3)	(207)	(1,169)	(1,924)	(2,566)	(3,137)	(1,501)

TABLE 44: EXTENSIVE CAPTURE, ENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	(13)	(820)	(5,047)	(8,821)	(12,352)	(16,057)	(7,185)
Alamo	(1)	(53)	(322)	(566)	(800)	(1,047)	(465)
Capital	(1)	(53)	(369)	(683)	(995)	(1,339)	(573)
Central	(1)	(62)	(426)	(736)	(1,012)	(1,281)	(586)
Gulf	(6)	(225)	(1,210)	(2,094)	(2,912)	(3,815)	(1,711)
High Plains	(1)	(36)	(221)	(378)	(517)	(655)	(301)
Metroplex	(2)	(193)	(1,292)	(2,289)	(3,245)	(4,271)	(1,882)
Northwest	(0)	(32)	(214)	(366)	(502)	(634)	(291)
South	(1)	(46)	(296)	(519)	(717)	(911)	(415)
East	(1)	(72)	(463)	(797)	(1,093)	(1,384)	(635)
West	(1)	(47)	(233)	(394)	(559)	(720)	(326)

HYDROGEN AND CARRIERS ECONOMIC IMPACT

The Hydrogen and Carriers scenario includes the decarbonization of the electric grid by 2050, and a significant shift to hydrogen. Additionally, excess electricity would be used to produce hydrogen or hydrogen carriers (e.g., synthetic methane and ammonia). Other sectors, including transportation, also leverage hydrogen as a key fuel in this scenario. This scenario results in an average annual increase in economic activity of \$122 billion compared to the BAU, and an increase of 763,700 jobs. Updating the energy grid results in economic benefits to the state (\$37.6 billion, 254,000 jobs). However, changes in nonenergy industry activity decreases the net economic activity (\$12.6 billion, 91,600 jobs). However, vast increases in hydrogen and related fuels results in \$97 billion of additional GDP and 601,000 additional jobs.

**TABLE 45: HYDROGEN AND CARRIERS, ECONOMIC IMPACT SUMMARY BY SOURCE,
AVERAGE, 2021-2050**

Source	Jobs	GDP (Ths, Fixed 2018 \$)
Energy Grid	254,381	37,612,323
Capital Investment	170,522	29,309,783
Fixed	117,655	15,068,465
Variable	10,917	2,922,341
Rates	(44,713)	(9,688,266)
Nonenergy Industry	(91,585)	(12,597,908)
<u>Fuel Sector</u>	<u>600,928</u>	<u>96,999,431</u>
Total	763,725	122,013,846

In this scenario, the electric power sector incurs an increase in capital investment of \$879 billion, fixed operating costs of \$184 billion, and an increase in variable costs of \$29 billion. Retail consumption spending (gross rates) increases by \$966 billion. Retirement costs increase modestly. Other fuel industry revenue increases by \$1.3 trillion, while nonenergy revenue decreases by \$660 billion. Retail consumption spending (i.e., customer rate changes) increase the most in the South and Metroplex regions, but all regions experience an increase in rates.

TABLE 46: HYDROGEN AND CARRIERS, CHANGE IN SPENDING, \$ MILLIONS

	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	Sum, \$ Millions 2021- 2050
All Regions							
Rates	13,221	62,257	126,339	309,969	275,301	179,062	966,149
Variable	9,471	4,079	273	19,320	6,067	(9,732)	29,479
Fixed	5,818	20,861	32,624	39,212	42,886	42,692	184,094
Capital Investment	133,132	219,744	150,783	149,380	130,918	95,388	879,344
Retirement Costs	748	(104)	(386)	382	890	1,523	3,054
Fuel Industry Revenue	103,022	225,596	264,735	266,382	247,566	206,747	1,314,048
Nonenergy Industry Revenue	19,718	(89,899)	(160,109)	(177,434)	(154,431)	(98,002)	(660,157)

TABLE 47: HYDROGEN AND CARRIERS, CHANGE IN UTILITY SECTOR SPENDING, 2021-2050, \$ MILLIONS

Region	Rates	Variable	Fixed	Capital Investment
All Regions	966,149	29,479	184,094	879,344
Alamo	25,892	(7,540)	5,873	42,783
Capital	10,297	(222)	7,005	36,463
Central	50,642	(24,322)	9,637	49,248
Gulf	9,381	24,658	5,335	36,813
High Plains	14,180	(7,668)	17,298	138,735
Metroplex	276,310	33,104	39,843	149,919
Northwest	25,499	(5,262)	30,652	123,130
South	344,048	17,984	32,236	109,491
East	51,930	3,811	10,325	81,573
West	157,969	(5,064)	25,889	111,190

TABLE 48: HYDROGEN AND CARRIERS, NET EMPLOYMENT IMPACTS, 2021-2050

	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	Average 2021- 2050
All Regions							
All Regions	588,988	876,673	801,598	610,335	714,591	990,162	763,725
Alamo	42,713	56,787	49,368	18,318	26,404	60,482	42,345
Capital	51,994	80,139	72,219	56,942	75,404	112,927	74,937
Central	21,235	34,370	41,046	47,678	51,690	49,049	40,845
Gulf	190,574	242,268	190,190	109,647	135,045	221,270	181,499
High Plains	24,680	40,075	51,728	52,168	54,462	48,436	45,258
Metroplex	158,459	238,053	240,530	158,358	197,266	325,645	219,718
Northwest	13,327	67,430	56,506	46,007	38,415	38,331	43,336
South	27,465	48,633	47,914	53,019	55,576	57,089	48,283
East	32,871	32,597	36,072	46,548	49,164	41,177	39,738
West	25,672	36,322	16,026	21,649	31,166	35,755	27,765

TABLE 49: HYDROGEN AND CARRIERS, NET GDP IMPACTS, 2021-2050

All Regions	Average						
	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
All Regions	83,020	136,038	129,567	109,360	117,885	156,213	122,014
Alamo	5,728	8,377	7,191	3,375	3,527	7,929	6,021
Capital	6,692	10,060	9,702	8,978	11,856	17,888	10,863
Central	5,080	8,705	9,475	11,605	12,832	12,137	9,972
Gulf	23,504	32,655	25,843	15,461	17,601	30,988	24,342
High Plains	5,232	7,236	12,012	11,066	10,559	6,811	8,819
Metroplex	19,995	35,470	38,824	30,264	36,039	57,802	36,399
Northwest	2,160	12,049	10,928	8,831	6,111	6,587	7,778
South	4,109	7,643	6,992	8,304	7,618	7,718	7,064
East	5,431	7,518	8,141	11,296	11,222	9,203	8,802
West	5,088	6,325	461	181	521	(851)	1,954

The following subsections quantify the changes in spending and economic impacts derived from the utility industry, other nonenergy industries, and other energy industries.

Hydrogen and Carriers Scenario Utility Sector Change

The increase in investment and operating expenditures in this scenario leads to net economic benefits in the state of Texas that average \$38 billion per year over the 30-year horizon and leads to a net increase in employment of 254,000 additional jobs compared to BAU, or a 4.1%-4.9% deviation from BAU. The largest economic benefits are in the Metroplex and Gulf Coast regions—the two largest economies.

TABLE 50: HYDROGEN AND CARRIERS, TEXAS UTILITY SECTOR ECONOMIC IMPACT (AVERAGE)

All Regions	Units	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2021-2050
Total Employment	Individuals (Jobs)	278,879	437,063	326,306	69,856	97,527	316,655	254,381
Private Non-Farm Employment	Individuals (Jobs)	260,223	400,835	293,019	53,955	93,418	300,645	233,683
Residence Adjusted Employment	Individuals	271,028	428,000	324,350	67,135	92,830	309,108	248,742
Population	Individuals	178,651	440,038	521,952	303,463	53,053	257,986	292,524
Labor Force	Individuals	134,244	288,119	289,237	108,281	4,469	185,306	168,276
Gross Domestic Product	Ths, Fixed 2018 \$	39,709,475	67,034,821	50,394,429	17,676,070	12,146,486	38,712,655	37,612,323
Output	Ths, Fixed 2018 \$	65,196,151	105,763,160	82,650,221	26,553,024	17,180,361	66,438,080	60,630,166
Personal Income	Ths, Fixed 2018 \$	21,519,239	39,099,140	34,457,709	13,597,981	11,231,192	35,610,267	25,919,255
Disposable Personal Income	Ths, Fixed 2018 \$	19,639,452	35,448,457	31,390,126	12,578,132	10,183,776	32,147,433	23,564,563

TABLE 51: HYDROGEN AND CARRIERS, TEXAS UTILITY SECTOR IMPACT ON EMPLOYMENT BY REGION (AVERAGE)

	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	278,879	437,063	326,306	69,856	97,527	316,655	254,381
Alamo	24,502	31,090	23,210	(10,377)	(6,537)	23,470	14,226
Capital	28,066	44,305	27,125	(1,408)	3,080	29,081	21,708
Central	4,051	4,684	5,034	7,120	8,199	4,735	5,637
Gulf	80,447	101,389	65,172	(18,645)	(5,658)	73,299	49,334
High Plains	15,485	25,031	33,793	32,072	33,004	26,626	27,669
Metroplex	76,181	120,842	106,251	(5,726)	(1,481)	96,464	65,422
Northwest	5,267	52,989	39,236	27,416	19,614	20,491	27,502
South	8,410	15,815	9,406	10,571	10,402	11,313	10,986
East	16,171	13,358	10,447	17,605	17,799	9,096	14,079
West	20,298	27,560	6,631	11,229	19,103	22,080	17,817

TABLE 52: HYDROGEN AND CARRIERS, TEXAS UTILITY SECTOR IMPACT ON GDP BY REGION (AVERAGE)

	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	39,709	67,035	50,394	17,676	12,146	38,713	37,612
Alamo	3,289	4,455	3,103	(908)	(1,150)	2,798	1,931
Capital	3,765	5,269	3,225	105	250	3,704	2,720
Central	1,572	1,870	474	1,026	1,238	164	1,057
Gulf	9,707	14,087	9,137	(1,532)	(1,086)	11,002	6,886
High Plains	3,474	3,990	8,050	6,672	5,958	2,224	5,061
Metroplex	8,810	17,456	16,248	1,358	(357)	14,023	9,590
Northwest	547	8,826	6,693	3,945	906	1,398	3,719
South	1,753	3,211	1,600	2,244	1,084	996	1,815
East	2,103	2,184	1,192	3,421	2,835	797	2,089
West	4,690	5,687	671	1,345	2,469	1,606	2,745

Hydrogen and Carriers Scenario Other Energy Industry and Nonenergy Industry Impacts

Additional economic impacts are derived from other energy industry impacts and nonenergy industry impacts, external from the power sector. Electrifying other nonenergy sectors lead to a decrease in economic impacts as transportation, buildings, and other industries increase investment; however, the increase in other (hydrogen-related) energy production leads to an increase in economic activity from the energy industry.

FIGURE 17: HYDROGEN AND CARRIERS, ENERGY INDUSTRY REVENUE CHANGE

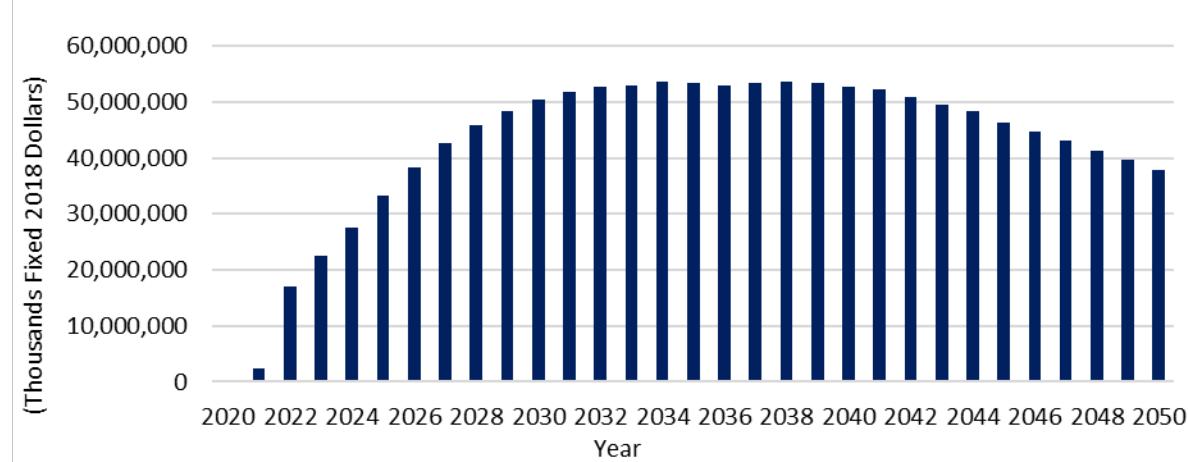


FIGURE 18: HYDROGEN AND CARRIERS, NONENERGY INDUSTRY REVENUE CHANGE

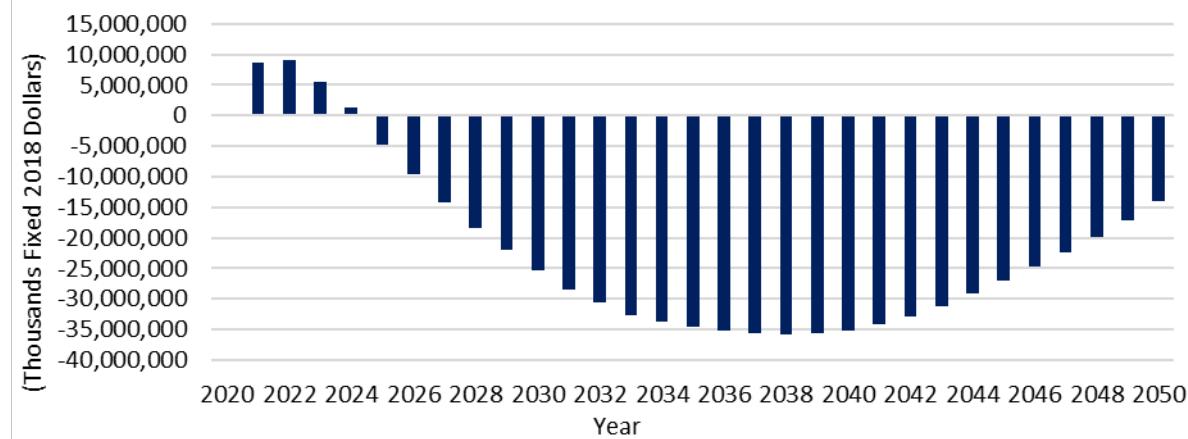


TABLE 53: HYDROGEN AND CARRIERS, NONENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	38,393	(154,779)	(198,894)	(156,236)	(84,335)	6,344	(91,585)
Alamo	3,847	(7,447)	(11,264)	(9,488)	(5,038)	1,119	(4,712)
Capital	2,508	(13,847)	(16,166)	(10,291)	(1,867)	7,968	(5,282)
Central	798	(6,391)	(8,928)	(8,069)	(5,887)	(2,873)	(5,225)
Gulf	19,957	(51,179)	(67,677)	(54,155)	(33,606)	(8,176)	(32,473)
High Plains	553	(3,859)	(4,590)	(3,313)	(1,500)	554	(2,026)
Metroplex	9,032	(37,845)	(48,246)	(34,257)	(9,119)	23,401	(16,172)
Northwest	(63)	(3,161)	(4,572)	(4,972)	(4,964)	(4,731)	(3,744)
South	1,784	(5,185)	(6,927)	(4,786)	(1,119)	3,313	(2,153)
East	(1,503)	(23,417)	(27,522)	(25,080)	(21,418)	(16,879)	(19,303)
West	1,481	(2,449)	(3,004)	(1,826)	184	2,647	(494)

TABLE 54: HYDROGEN AND CARRIERS, NONENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	4,016	(19,168)	(26,912)	(23,054)	(12,958)	2,488	(12,598)
Alamo	410	(866)	(1,534)	(1,570)	(1,141)	(298)	(833)
Capital	182	(1,739)	(2,148)	(1,409)	(100)	1,650	(594)
Central	91	(665)	(1,021)	(996)	(757)	(345)	(616)
Gulf	2,190	(6,950)	(9,959)	(8,692)	(5,687)	(1,144)	(5,040)
High Plains	30	(535)	(736)	(663)	(453)	(135)	(415)
Metroplex	1,080	(4,433)	(6,222)	(4,648)	(722)	5,233	(1,619)
Northwest	0	(282)	(452)	(530)	(556)	(544)	(394)
South	123	(608)	(915)	(785)	(379)	244	(387)
East	(195)	(2,675)	(3,456)	(3,469)	(3,228)	(2,746)	(2,628)
West	104	(415)	(468)	(292)	66	572	(72)

TABLE 55: HYDROGEN AND CARRIERS, ENERGY INDUSTRY EMPLOYMENT IMPACTS BY REGION (AVERAGE)

All Regions	Average						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	271,717	594,390	674,187	696,715	701,399	667,162	600,928
Alamo	14,365	33,144	37,422	38,183	37,978	35,893	32,831
Capital	21,419	49,681	61,259	68,641	74,190	75,877	58,511
Central	16,385	36,076	44,940	48,628	49,378	47,187	40,432
Gulf	90,171	192,057	192,694	182,447	174,308	156,147	164,638
High Plains	8,642	18,903	22,525	23,408	22,957	21,257	19,615
Metroplex	73,246	155,057	182,524	198,341	207,867	205,779	170,469
Northwest	8,122	17,602	21,841	23,563	23,765	22,570	19,577
South	17,271	38,003	45,435	47,235	46,293	42,463	39,450
East	18,203	42,655	53,148	54,024	52,783	48,961	44,962
West	3,892	11,211	12,399	12,245	11,879	11,028	10,442

TABLE 56: HYDROGEN AND CARRIERS, ENERGY INDUSTRY GDP IMPACTS BY REGION (AVERAGE)

All Regions	Average, \$ Millions						
	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2021- 2050
All Regions	39,295	88,171	106,085	114,738	118,697	115,012	96,999
Alamo	2,030	4,788	5,621	5,854	5,818	5,429	4,923
Capital	2,745	6,529	8,625	10,283	11,706	12,533	8,737
Central	3,417	7,500	10,022	11,576	12,351	12,318	9,530
Gulf	11,607	25,519	26,665	25,684	24,374	21,130	22,496
High Plains	1,728	3,782	4,698	5,057	5,054	4,722	4,173
Metroplex	10,105	22,447	28,798	33,553	37,118	38,545	28,428
Northwest	1,613	3,505	4,686	5,416	5,761	5,733	4,452
South	2,233	5,040	6,307	6,845	6,913	6,478	5,636
East	3,523	8,010	10,405	11,344	11,614	11,152	9,341
West	294	1,053	258	(873)	(2,014)	(3,029)	(719)

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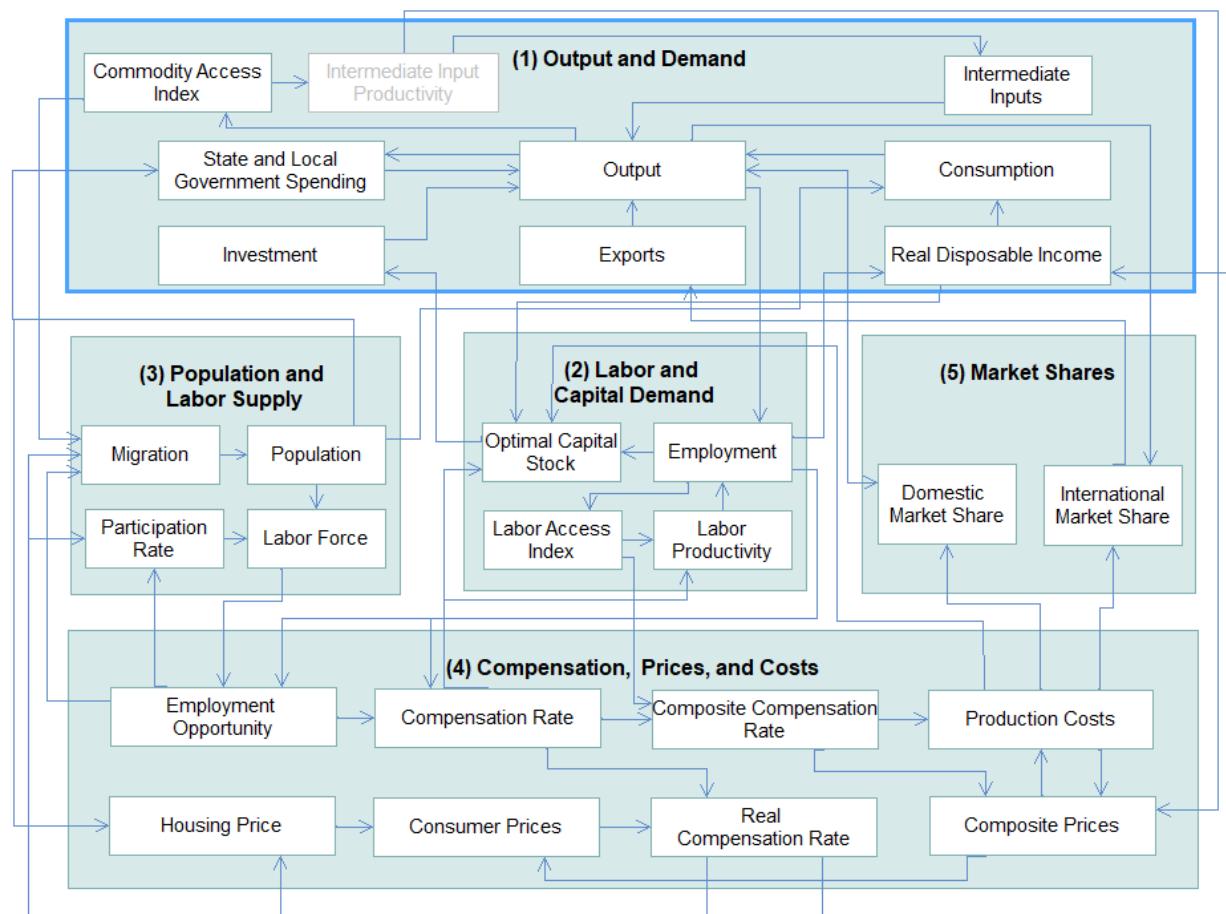
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APPENDIX 1: OVERVIEW OF REMI POLICY INSIGHT

This summary was provided by REMI, Inc.

Policy Insight is a structural economic forecasting and policy analysis model. It integrates input-output, computable general equilibrium, econometric, and economic geography methodologies. The model is dynamic, with forecasts and simulations generated on an annual basis and behavioral responses to wage, price, and other economic factors.

The REMI model consists of thousands of simultaneous equations with a structure that is relatively straightforward. The exact number of equations used varies depending on the extent of industry, demographic, demand, and other detail in the model. The overall structure of the model can be summarized in five major blocks: (1) Output and Demand, (2) Labor and Capital Demand, (3) Population and Labor Supply, (4) Compensation, Prices and Costs, and (5) Market Shares.



Block 1. Output and Demand

This block includes output, demand, consumption, investment, government spending, import, product access, and export concepts. For each industry, demand is determined by the amount of output,

consumption, investment and capital demand on that industry. Consumption depends on real disposable income per capita, relative prices, differential income elasticities and population. Input productivity depends on access to inputs because the larger the choice set of inputs, the more likely that the input with the specific characteristics required for the job will be formed. In the capital stock adjustment process, investment occurs to fill the difference between optimal and actual capital stock for residential, non-residential, and equipment investment. Government spending changes are determined by changes in the population.

Block 2. Labor and Capital Demand

The Labor and Capital Demand block includes the determination of labor productivity, labor intensity and the optimal capital stocks. Industry-specific labor productivity depends on the availability of workers with differentiated skills for the occupations used in each industry. The occupational labor supply and commuting costs determine firms' access to a specialized labor force.

Labor intensity is determined by the cost of labor relative to the other factor inputs, capital and fuel. Demand for capital is driven by the optimal capital stock equation for both non-residential capital and equipment. Optimal capital stock for each industry depends on the relative cost of labor and capital, and the employment weighted by capital use for each industry. Employment in private industries is determined by the value added and employment per unit of value added in each industry.

Block 3. Population and Labor Supply

The Population and Labor Supply block includes detailed demographic information about the region. Population data is given for age and gender, with birth and survival rates for each group. The size and labor force participation rate of each group determines the labor supply. These participation rates respond to changes in employment relative to the potential labor force and to changes in the real after tax compensation rate. Migration includes retirement, military, international and economic migration. Economic migration is determined by the relative real after tax compensation rate, relative employment opportunity and consumer access to variety.

Block 4. Wages, Prices, and Costs

This block includes delivered prices, production costs, equipment cost, the consumption deflator, consumer prices, the price of housing, and the wage equation. Economic geography concepts account for the productivity and price effects of access to specialized labor, goods and services.

These prices measure the price of the industry output, taking into account the access to production locations. This access is important due to the specialization of production that takes place within each industry, and because transportation and transaction costs of distance are significant. Composite prices for each industry are then calculated based on the production costs of supplying regions, the effective distance to these regions, and the index of access to the variety of output in the industry relative to the access by other uses of the product.

The cost of production for each industry is determined by cost of labor, capital, fuel and intermediate inputs. Labor costs reflect a productivity adjustment to account for access to specialized labor, as well as underlying compensation rates. Capital costs include costs of non-residential structures and equipment, while fuel costs incorporate electricity, natural gas and residual fuels.

The consumption deflator converts industry prices to prices for consumption commodities. For potential migrants, the consumer price is additionally calculated to include housing prices. Housing price changes from their initial level depend on changes in income and population density.

Compensation changes are due to changes in labor demand and supply conditions and changes in the national compensation rate. Changes in employment opportunities relative to the labor force and occupational demand change determine compensation rates by industry.

Block 5. Market Shares

The Market Shares equations measure the proportion of local and export markets that are captured by each industry. These depend on relative production costs, the estimated price elasticity of demand, and effective distance between the home region and each of the other regions. The change in share of a specific area in any region depends on changes in its delivered price and the quantity it produces compared with the same factors for competitors in that market. The share of local and external markets then drives the exports from and imports to the home economy.

The Labor and Capital Demand block includes labor intensity and productivity as well as demand for labor and capital. Labor force participation rate and migration equations are in the Population and Labor Supply block. The Wages, Prices, and Costs block includes composite prices, determinants of production costs, the consumption price deflator, housing prices, and the wage equations. The proportion of local, inter-regional and export markets captured by each region is included in the Market Shares block.

APPENDIX 2: MAPPING WEBBER/EPS VARIABLES TO REMI

TABLE 57: VARIABLE COSTS INPUT VARIABLES

Project Variable Name	REMI Variable Name	Industry
Variable_CCGT_BAU+DAC	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Variable_CCS_BAU+DAC	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Variable_Coal_BAU	Power Plant Operation and Maintenance	Coal-Fired Plant
Variable_CT_BAU+DAC	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Variable_CycleStorage_BAU+DAC	Industry Sales (Exogenous Production)	Pipeline transportation
Variable_DAC_BAU+DAC	Detailed Industry Sales (Exogenous Production)	Industrial and commercial fan and blower and air purification equipment manufacturing
Variable_DeepStorage_BAU+DAC	Detailed Industry Sales (Exogenous Production)	Drilling oil and gas wells
Variable_DistributedPV_BAU+DAC	Power Plant Operation and Maintenance	Solar Farm
Variable_Distribution_BAU+DAC	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Variable_Geothermal_BAU+DAC	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Variable_H2_BAU+DAC	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Variable_Hydro_BAU+DAC	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Variable_Industrial_BAU+DAC	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Variable_Nuclear_BAU+DAC	Power Plant Operation and Maintenance	Nuclear Plant
Variable_OffshoreWind_BAU+DAC	Power Plant Operation and Maintenance	Wind Farm (Offshore)
Variable_SMR_BAU+DAC	Power Plant Operation and Maintenance	Nuclear Plant
Variable_Storage_BAU+DAC	Detailed Industry Sales (Exogenous Production)	Storage battery manufacturing
Variable_Transmission_BAU+DAC	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Variable_UtilityPV_BAU+DAC	Power Plant Operation and Maintenance	Solar Farm
Variable_Wind_BAU+DAC	Power Plant Operation and Maintenance	Wind Farm (Onshore)

TABLE 58: FIXED COSTS INPUT VARIABLES

Project Variable Name	REMI Variable Name	Industry
Fixed_CCGT_ELEC+H2	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Fixed_CCS_ELEC+H2	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Fixed_Coal_ELEC+H2	Power Plant Operation and Maintenance	Coal-Fired Plant
Fixed_CT_ELEC+H2	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Fixed_CycleStorage_ELEC+H2	Industry Sales (Exogenous Production)	Pipeline transportation
Fixed_DAC_ELEC+H2	Detailed Industry Sales (Exogenous Production)	Industrial and commercial fan and blower and air purification equipment manufacturing
Fixed_DeepStorage_ELEC+H2	Detailed Industry Sales (Exogenous Production)	Drilling oil and gas wells
Fixed_DistributedPV_ELEC+H2	Power Plant Operation and Maintenance	Solar Farm
Fixed_Distribution_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Fixed_Geothermal_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Fixed_H2_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Fixed_Hydro_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Fixed_Industrial_ELEC+H2	Power Plant Operation and Maintenance	Natural Gas-Fired Plant
Fixed_Nuclear_ELEC+H2	Power Plant Operation and Maintenance	Nuclear Plant
Fixed_OffshoreWind_ELEC+H2	Power Plant Operation and Maintenance	Wind Farm (Offshore)
Fixed_SMR_ELEC+H2	Power Plant Operation and Maintenance	Nuclear Plant
Fixed_Storage_ELEC+H2	Detailed Industry Sales (Exogenous Production)	Storage battery manufacturing
Fixed_Transmission_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
Fixed_UtilityPV_ELEC+H2	Power Plant Operation and Maintenance	Solar Farm
Fixed_Wind_ELEC+H2	Power Plant Operation and Maintenance	Wind Farm (Onshore)
FixedCosts_Fertilizer_Elec+H2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
FixedCosts_FertilizerStorage_Elec+H2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
FixedCosts_NH3_Storage_Elec+H2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
FixedCosts_NH3_ElecH2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
FixedCosts_RNG_ElecH2	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
FixedCosts_RNG_Storage_Elec+H2	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing

TABLE 59: CAPITAL INVESTMENT INPUT VARIABLES

Project Variable Name	REMI Variable Name	Industry
newCapitalInvestment_CCGT_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_CCS_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_Coal_ELEC+H2	Power Plant Construction	Coal-Fired Plant
newCapitalInvestment_CT_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_CycleStorage_El_Output	Detailed Industry Sales (Exogenous Production)	Industry (Exogenous Production): Pipeline transportation
newCapitalInvestment_DAC_ELEC+H2	Detailed Industry Sales (Exogenous Production)	Industrial and commercial fan and blower and air purification equipment manufacturing
newCapitalInvestment_Deepstorage_El	Detailed Industry Sales (Exogenous Production)	Drilling oil and gas wells
newCapitalInvestment_DistributedPV_El	Power Plant Construction	Solar Farm
newCapitalInvestment_Distribution_El_Output	Detailed Industry Sales (Exogenous Production)	Industry (Exogenous Production): Electric power generation, transmission and distribution
newCapitalInvestment_Geothermal_El	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_H2_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_Hydro_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_IndustrialCCS_El	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_Nuclear_ELEC+H Power Plant Construction	Nuclear Plant	Nuclear Plant
newCapitalInvestment_OffshoreWind_I	Power Plant Construction	Wind Farm (Offshore)
newCapitalInvestment_SMR_ELEC+H2	Power Plant Construction	Nuclear Plant
newCapitalInvestment_Transmission_El	Detailed Industry Sales (Exogenous Production)	Storage battery manufacturing
newCapitalInvestment_UtilityPV_ELEC+H2	Power Plant Construction	Electric power generation, transmission and distribution
newCapitalInvestment_Wind_ELEC+H2	Power Plant Construction	Solar Farm
newCapitalInvestment_Fertilizer_Elect	Industry Sales (Exogenous Production)	Wind Farm (Onshore)
newCapitalInvestment_FertilizerStorage_El	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_NH3_Storage_El	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_NH3_Elec+H2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_RNG_Elec+H2	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
newCapitalInvestment_RNG_Storage_El	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
newCapitalInvestment_CO2_Transp	Industry Sales (Exogenous Production)	Pipeline transportation
newCapitalInvestment_RNG_Transp	Industry Sales (Exogenous Production)	Pipeline transportation
newCapitalInvestment_NH3_Transp	Industry Sales (Exogenous Production)	Pipeline transportation

TABLE 60: CAPITAL INVESTMENT INPUT VARIABLES

Project Variable Name	REMI Variable Name	Industry
newCapitalInvestment_CCGT_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_CCS_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_Coal_ELEC+H2	Power Plant Construction	Coal-Fired Plant
newCapitalInvestment_CT_ELEC+H2	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_CycleStorage_El_Output	Detailed Industry Sales (Exogenous Production)	Industry (Exogenous Production): Pipeline transportation
newCapitalInvestment_DAC_ELEC+H2	Detailed Industry Sales (Exogenous Production)	Industrial and commercial fan and blower and air purification equipment manufacturing
newCapitalInvestment_Deepstorage_El	Detailed Industry Sales (Exogenous Production)	Drilling oil and gas wells
newCapitalInvestment_DistributedPV_El	Power Plant Construction	Solar Farm
newCapitalInvestment_Distribution_El_Output	Detailed Industry Sales (Exogenous Production)	Industry (Exogenous Production): Electric power generation, transmission and distribution
newCapitalInvestment_Geothermal_El	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_H2_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_Hydro_ELEC+H2	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
newCapitalInvestment_IndustrialCCS_El	Power Plant Construction	Natural Gas-Fired Plant
newCapitalInvestment_Nuclear_ELEC+H Power Plant Construction		Nuclear Plant
newCapitalInvestment_OffshoreWind_I	Power Plant Construction	Wind Farm (Offshore)
newCapitalInvestment_SMR_ELEC+H2	Power Plant Construction	Nuclear Plant
newCapitalInvestment_Transmission_El	Detailed Industry Sales (Exogenous Production)	Storage battery manufacturing
newCapitalInvestment_UtilityPV_ELEC+	Power Plant Construction	Electric power generation, transmission and distribution
newCapitalInvestment_Wind_ELEC+H2	Power Plant Construction	Solar Farm
newCapitalInvestment_Fertilizer_Elect	Industry Sales (Exogenous Production)	Wind Farm (Onshore)
newCapitalInvestment_FertilizerStorage_El	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_NH3_Storage_El	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_NH3_Elec+H2	Industry Sales (Exogenous Production)	Pesticide, fertilizer, and other agricultural chemical manufacturing
newCapitalInvestment_RNG_Elec+H2	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
newCapitalInvestment_RNG_Storage_El	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
newCapitalInvestment_CO2_Transp	Industry Sales (Exogenous Production)	Pipeline transportation
newCapitalInvestment_RNG_Transp	Industry Sales (Exogenous Production)	Pipeline transportation
newCapitalInvestment_NH3_Transp	Industry Sales (Exogenous Production)	Pipeline transportation

TABLE 61: RETAIL CONSUMPTION SPENDING INPUT VARIABLE

Project Variable Name	REMI Variable Name	Industry
RetailConsumptionSpending_ELEC2035	Fuel Price	Electricity

TABLE 62: OTHER ENERGY AND NONENERGY INDUSTRY INPUT VARIABLES

Project Variable Name	REMI Variable Name	Industry
ISIC 01T03 Oilseed farming	Industry Sales (Exogenous Production)	Forestry and Logging
ISIC 05T06 Oil and gas extraction	Industry Sales (Exogenous Production)	Oil and gas extraction
ISIC 07T08 Copper, nickel, lead, and zinc mining	Industry Sales (Exogenous Production)	Metal ore mining
ISIC 09 Drilling oil and gas wells	Industry Sales (Exogenous Production)	Support activities for mining
ISIC 10T12 Dog and cat food manufacturing	Industry Sales (Exogenous Production)	Animal food manufacturing
ISIC 13T15 Fiber, yarn, and thread mills	Industry Sales (Exogenous Production)	Textile mills and textile product mills
ISIC 16 Sawmills and wood preservation	Industry Sales (Exogenous Production)	Pulp, paper, and paperboard mills
ISIC 17T18 Pulp mills	Industry Sales (Exogenous Production)	Pulp, paper, and paperboard mills
ISIC 19 Petroleum refineries	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
ISIC 20 Petrochemical manufacturing	Industry Sales (Exogenous Production)	Petroleum and coal products manufacturing
ISIC 21 Medicinal and botanical manufacturing	Industry Sales (Exogenous Production)	Pharmaceutical and medicine manufacturing
ISIC 22 Plastics, packaging materials and unlaminated film and sheet manufacturing	Industry Sales (Exogenous Production)	Plastics product manufacturing
ISIC 23 Clay product and refractory manufacturing	Industry Sales (Exogenous Production)	Clay product and refractory manufacturing
ISIC 24 Iron and steel mills and ferroalloy manufacturing	Industry Sales (Exogenous Production)	Iron and steel mills and ferroalloy manufacturing
ISIC 25 Steel product manufacturing from purchased steel	Industry Sales (Exogenous Production)	Steel product manufacturing from purchased steel
ISIC 26 Electronic computer manufacturing	Industry Sales (Exogenous Production)	Computer and peripheral equipment manufacturing, excluding digital camera manufacturing
ISIC 27 Electric lamp bulb and part manufacturing	Industry Sales (Exogenous Production)	Electric lighting equipment manufacturing
ISIC 28 Farm machinery and equipment manufacturing	Industry Sales (Exogenous Production)	Agriculture, construction, and mining machinery manufacturing
ISIC 29 Automobile manufacturing	Industry Sales (Exogenous Production)	Motor vehicle manufacturing
ISIC 30 Aircraft manufacturing	Industry Sales (Exogenous Production)	Aerospace product and parts manufacturing
ISIC 31T33 Wood kitchen cabinet and countertop manufacturing	Industry Sales (Exogenous Production)	Household and institutional furniture and kitchen cabinet manufacturing
ISIC 35T39 Electric power generation, transmission, and distribution	Industry Sales (Exogenous Production)	Electric power generation, transmission and distribution
ISIC 41T43 Motor vehicle and motor vehicle parts and supplies	Industry Sales (Exogenous Production)	Wholesale trade
ISIC 45T47 Air transportation	Industry Sales (Exogenous Production)	Air transportation
ISIC 49T53 Accommodation	Industry Sales (Exogenous Production)	Accommodation
ISIC 55T56 Accommodation	Industry Sales (Exogenous Production)	Newspaper, periodical, book, and directory publishers
ISIC 58T60 Newspaper publishers	Industry Sales (Exogenous Production)	Telecommunications
ISIC 61 Wired telecommunications carriers	Industry Sales (Exogenous Production)	Data processing, hosting, and related services
ISIC 62T63 Data processing, hosting, and related services	Industry Sales (Exogenous Production)	Monetary authorities, credit intermediation, and related activities
ISIC 64T66 Nondepository credit intermediation and related activities	Industry Sales (Exogenous Production)	Real estate
ISIC 68 Owner-occupied housing	Industry Sales (Exogenous Production)	Legal services
ISIC 69T82 Legal services	Industry Sales (Exogenous Production)	Federal Military Government Output
ISIC 84 Federal general government (defense)	Industry Sales (Exogenous Production)	Total
ISIC 85 Elementary and secondary schools	Industry Sales (Exogenous Production)	State and Local Government
ISIC 86T88 Offices of physicians	Industry Sales (Exogenous Production)	Offices of health practitioners
ISIC 90T96 Performing arts companies	Industry Sales (Exogenous Production)	Performing arts companies; Promoters of events, and agents and managers
ISIC 97T98 Private households	Industry Sales (Exogenous Production)	Private households