2024 UPDATE ON ELECTRICITY CUSTOMER CHOICE IN OHIO

COMPETITION OUTPERFORMS MONOPOLY REGULATION

NOPEC
Northeast Ohio Public Energy Council

2024 UPDATE ON ELECTRICITY CUSTOMER CHOICE IN OHIO

NOPEC
Northeast Ohio Public Energy Council

COMPETITION OUTPERFORMS MONOPOLY REGULATION

Prepared by:

CSU | Levin College of Public Affairs and Education

Cleveland State University:

Andrew Thomas
Mark Henning

Prepared for: Northeast Ohio Public Energy Council

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This Study is the third investigation undertaken by researchers from Cleveland State University (the Study Team) to consider how Ohio's deregulated electricity markets have performed since restructuring first took effect in 2009. This new study examines an important new time period in Ohio's electricity markets: the pandemic and post pandemic era, during which time U.S. electricity retail markets have experienced some turmoil. What we have learned is that deregulated markets continue to save Ohio ratepayers nearly $3 billion per year – including during the recent period of energy market upheaval.

Ohio's path to deregulated electricity markets began in 1999 with the passage of Senate Bill 3. After a decade of "rate stabilization" planning, the markets were opened up in earnest in 2009, and by 2011 Ohio had attracted a growing presence of Competitive Retail Electric Service (CRES) providers and governmental aggregators. By 2014, all four of Ohio's Investor Owned Utilities had moved largely away from the old, regulated "cost basis" model for recovering generation expenditures, replacing it with Competitive Bidding Process (CBP) auctions to set a "Price to Compare" (PTC) as the alternative market to consumer shopping.

Since 2011, Ohio consumers have saved over $37 billion due to deregulation. Ratepayers saved over $13 billion over the past five years and are on schedule to save another $2.7 billion in 2024. In 2020, the year that the pandemic shut down many businesses, Ohio ratepayers still saved over $2.6 billion.

Year	Total
2011-2018	$21,278
2019	$2,725
2020	$2,612
2021	$2,714
2022	$2,734
2023	$2,702
2024 (est.)	$2,749
Total	**$37,513**

Amounts are in 2023 dollars.

Of the $16 billion in savings since 2019 (including 2024), around $6 billion went to residential users, and around $10 billion to commercial and industrial users. Roughly $7 billion of the $16 billion came through shopping, while $9 billion came from the CBP auctions, which set the Price to Compare.

Savings Due to Deregulated Electricity Generation Markets by Customer Class from 2019 to 2024 (millions of dollars)

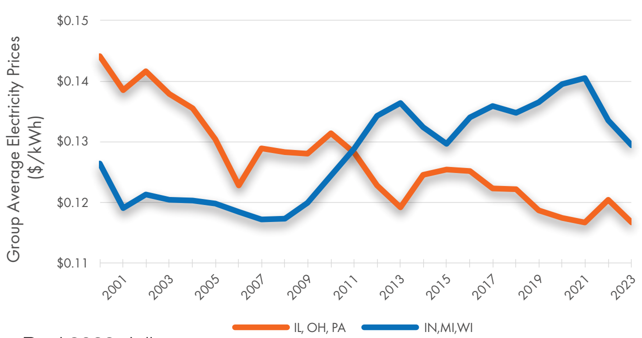
Year	Residential	Commercial & Industrial
2019	$1,085	$1,639
2020	$1,085	$1,527
2021	$1,103	$1,611
2022	$1,100	$1,634
2023	$1,035	$1,667
2024 (est.)	$1,037	$1,712
Total	**$6,445**	**$9,790**

Amounts are in 2023 dollars.

To estimate savings from deregulation, the Study Team used a statistical technique called “propensity score matching” to identify six similar Midwestern states. Three states (Michigan, Indiana and Wisconsin) are fully regulated, while three states (Ohio, Pennsylvania and Illinois) have deregulated generation. As can be seen from the folloiwing figure, competition has driven down average electricity prices in the three deregulated Midwestern states, while their regulated peers have seen a steady increase in the price of generated electricity. Ratepayers in these regulated states are saddled with the cost of aging, uneconomic power plants, while competitive markets in the deregulated states have incentivized investment into new, efficient and cost effective generation and have accessed wider, multi-state markets for generated electricity.

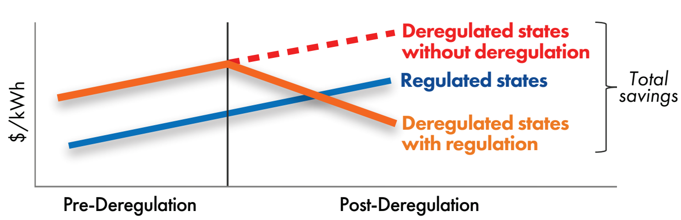
The Study Team used Energy Information Agency (EIA) and Public Utilities Commission of Ohio (PUCO) data to estimate the total savings realized from competitive generation markets. Difference-in-Difference statistical modeling was used to isolate the effects of deregulation. The Difference-in-Difference model estimated Ohio’s electricity price had it not deregulated, but instead followed the path of the statistically similar regulated states (Michigan, Indiana and Wisconsin).

Average Total Electricity Prices in All Sectors in Six Midwestern States 2000 - 2023



Real 2023 dollars

DIFFERENCE-IN-DIFFERENCE MODEL



Since deregulation took practical effect in 2011, Residential customers have paid $0.0251/kWh less for electricity on average than they otherwise would have had generation markets not been restructured. Likewise, Commercial & Industrial customers in Ohio have paid $0.0201/kWh less during this time frame. Using PUCO data for customer count and megawatt-hour sales, these savings can be converted to average savings per customer:

SAVINGS FROM DEREGULATION IN OHIO BY CUSTOMER CLASS FOR 2011-2023

Customer Class	Estimated Monthly Savings	Estimated Annual Savings	Estimated Total Savings
Residential	$21.79	$261.47	$3,399.12
Commercial	$124.36	$1,492.32	$19,400.16
Industrial	$4,570.06	$54,840.68	$712,928.78

All dollar amounts are in 2023 dollars

Despite the many benefits of competition, Ohio has been faced with efforts to undermine the viability of its deregulated electricity markets. Investor Owned Utilities have exploited flaws in Ohio’s regulatory and legislative systems to obtain cross-subsidies to support unprofitable generating facilities (for example, Ohio’s House Bill 6 continues to subsidize coal plants). These efforts threaten to undermine the full benefits consumers might otherwise realize from competitive markets and deregulation.

Deregulation has been a marked success for the Midwestern States of Ohio, Illinois and Pennsylvania. It has kept generation costs low, even as other components of the cost of electricity have risen faster than inflation. In Ohio, this has meant ratepayer savings of some $37 billion over the last 15 years, and $16 billion over the last five. Ohio will continue to enjoy such savings in the coming years so long as its electricity generation markets are fully deregulated.

1 INTRODUCTION

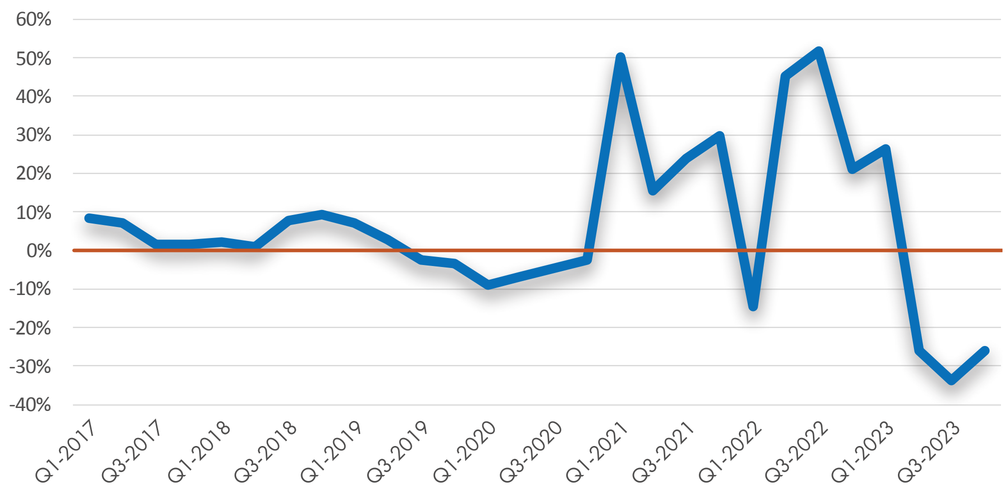
1.1 BACKGROUND

This Study is the third investigation undertaken by researchers from Cleveland State University (the Study Team) to consider how Ohio's deregulated electricity markets have performed since restructuring first took effect in 2009. This new study examines an important new time period in Ohio's electricity markets: the pandemic and post pandemic era, during which time U.S. electricity retail markets have been in turmoil. What we have learned is that deregulated markets continue to save ratepayers money even during times of upheaval in energy markets.

Prior to the pandemic in the spring of 2020, electric power generation experienced low to moderate inflation since 2017.[1] See Figure 1 below. By early 2021, the cost of producing power spiked in response to a pandemic-created supply chain shortage. This was followed by more inflation in early 2022, due to natural gas price escalation after the Russian invasion of Ukraine.[2] As a result, over a three-year period, the U.S. saw rapid inflation for energy generation costs. See Figure 1.

FIGURE 1

Annual Inflation Rate for Electric Power Generation in the U.S.



Data source: U.S. Bureau of Labor Statistics via Federal Reserve Bank of St. Louis (2024)

[1] Year-over-year inflation for any 12-month period for 2017-2020 averaged less than 2% for electric power generation. See U.S. Bureau of Labor Statistics, Producer Price Index by Industry: Electric Power Generation: Utilities [PCU2211102211104], retrieved from FRED, Federal Reserve Bank of St. Louis; *https://fred.stlouisfed.org/series/PCU2211102211104.*

[2] See e.g. N. Chiwaya, "Why Russia's Ukraine Invasion Spiked Energy Prices," NBC News, February 24, 2022. *https://www.nbcnews.com/news/world/why-russia-s-ukraine-invasion-spiked-energy-prices-4-charts-n1289799*

More recently, 2023 saw the change in the price level for electric power generation returning to pre-pandemic era rates. Natural gas prices fell back to pre-2020 levels, and supply chain problems were largely resolved. By the end of 2023, power generation began to experience deflation. See Figure 1. Indeed, FirstEnergy saw a 27% drop in its Competitive Bid Process (CBP) auction (which sets its Standard Service Offer, or SSO), by the summer of 2024.[3]

But electricity costs may not stay low in the coming decade. Over the past 20 years, electricity demand in the U.S. has been flat, due in part to innovations and in part to economic headwinds, including a downturn in domestic manufacturing.[4] Now, however, the Department of Energy is anticipating that electrification, expansion in data centers, and new domestic manufacturing could lead to demand growing by 15 to 20% in the coming decade. Some experts have suggested that overall U.S. demand could increase by 9% in the next five years.[5] If insufficient, new, low-cost generation is built to meet this demand, prices may go up.

Data centers appear to be driving the anticipated near-term demand growth. According to a study by Goldman Sachs, the AI revolution is likely to drive up data center demand 160% by 2030.[6] Data center energy demand is projected to grow from around 1-2% of all power consumed (about 4 terawatt-hours) to around 3-4% of total power by the end of the decade. In the U.S., data centers used about 3% of overall power in 2022. By 2030, it is expected to be around 8%.[7] The Electrical Power Research Institute estimates U.S. consumption was 4% in 2023, and could reach 9% by 2030.[8]

Ohio has been the target of data center growth planning. AEP Ohio, for example, projects 15 GW of new load in its territory by 2030, driven by Amazon, Google, and other data centers.[9] The electric utility opened a proceeding before the Public Utility Commission of Ohio (PUCO) in May of 2024 seeking new tariffs designed for this increased load.[10]

Yet new generation is on the way to meet this demand. Within PJM Interconnection, the Regional Transmission Organization (RTO) which manages Ohio's transmission and capacity, nearly 450 projects totaling 37.2 GW in nameplate capacity have signed interconnection agreements. While only 2 GW have been built so far in 2024, 8.6 GW are under construction and another 16.5 GW are in the engineering and procurement stage.[11]

---

[3] S. McDonnell, "Electricity prices for thousands of FirstEnergy customers will drop this summer," Cleveland Plain Dealer, April 11, 2024, *https://www.cleveland.com/news/2024/04/electricity-prices-for-thousands-of-firstenergycustomers- will-drop-this-summer.html*

[4] "Clean Energy Resources to Meet Data Center Electricity Demand," Department of Energy Office of Policy, August 12, 2024. *https://www.energy.gov/policy/articles/clean-energy-resources-meet-data-center-electricity-demand*

[5] See e.g. *https://www.icf.com/news/2024/09/icf-report-projects-surge-in-us-electricity-demand-by-2028*

[6] "AI Poised to Drive 160 Percent Increase in Power Demand," May 14, 2024, *https://www.goldmansachs.com/insights/articles/AI-poised-to-drive-160-increase-in-power-demand*

[7] Id.

[8] "Clean Energy Resources," Department of Energy, supra note 4.

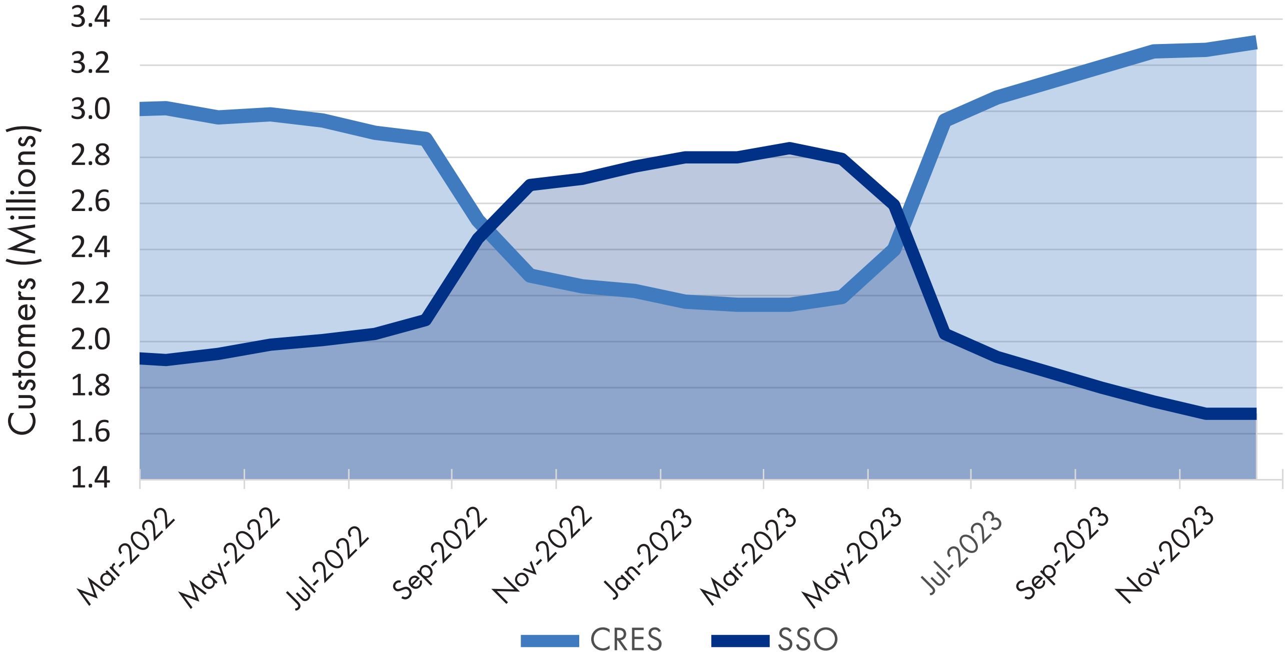
[9] *https://www.utilitydive.com/news/aep-data-centers-amazon-google-load-growth-epa/714806/*

[10] *https://www.utilitydive.com/news/aep-ohio-data-center-crypto-rates-puc/716150/*

[11] E. Howland, "PJM says 'concerns are growing' after less than 2 GW added this year," Utility Dive, Sept 26, 2024. *https://www.utilitydive.com/news/pjm-interconnection-capacity-online-construction-shortfall-vcrenewables/728145/?utm source=Sailthru&utm_medium=email&utm_campaign=Newsletter%20Weekly%20Roundup:%20Utility%20Dive:%20Daily%2 Dive%2009-28-2024&utm_term=Utility%20Dive%20Weekender*

FIGURE 2

Customer Count by Source of Generation Supply (All Customer Classes)



Data source: U.S. Bureau of Labor Statistics via Federal Reserve Bank of St. Louis (2024)

In the spring of 2021, the COVID pandemic introduced new challenges to Ohio's electricity markets. Electricity demand dropped during the lockdown, with reductions in commercial and industrial use only partially offset by increases in residential uses.[12] This was followed by supply chain problems that caused price increases, and even bigger price spikes resulting from the Ukraine war. By 2022, as seen in Figure 2, retail electricity prices rose so rapidly that large numbers of end users migrated from the retail market into the utility SSOs, which had been set by auctions that occurred before the price spike.

But soon thereafter, the auctions began to reflect the new pricing. Now the auction bids included something that utilities had not been seriously placing into their bids previously: a premium to offset the risk that large numbers of end users might again migrate back into the standard service offer. As a result, by 2023, the SSOs were once again considerably higher than the shopping rates.

Concerns about future demand, together with the COVID era price volatility, lead to questions about how well Ohio's deregulated markets have performed since 2019. Prior reports undertaken by the Study Team indicated that the deregulated markets have worked well in Ohio – saving Ohio rate payers as much as $3 billion/year between 2011 and 2018.[13]

Yet, as will be shown herein, through all this uncertainty, Ohio's deregulated electricity markets continued to deliver significant savings to ratepayers. We estimate that deregulation of retail electricity markets has delivered $13.5 billion in savings to Ohio customers from 2019-2023. An additional savings of $2.7 billion is projected for 2024.

[12] See, e.g. "COVID Impact on Electricity, IEA report, January 2021, *https://www.iea.org/reports/covid-19-impacton-electricity*

[13] See: Thomas, Andrew R.; Bowen, William M.; Hill, Edward W.; Kanter, Adam; and Lim, Taekyoung, "Electricity Customer Choice in Ohio: How Competition Has Outperformed Traditional Monopoly Regulation" (2016). Urban Publications. 0 1 2 3 1416. *https://engagedscholarship.csuohio.edu/urban_facpub/1416*

1.2 LITERATURE REVIEW UPDATE

Searches have been undertaken for each of the three studies for literature evaluating the effects of competitive retail electricity markets on cost to ratepayers. The majority of research indicates that market-based regulation leads to performance improvements benefiting consumers through lower prices.[14] One paper, however, noted that even while restructured energy markets may bring lower generation prices, such reductions may not mean lower total electricity prices if those savings are voided by increased regulatory charges passed through to ratepayers on their distribution bills.[15]

One recent study addressed the challenges of separating generation from the distribution costs when utilities provide electricity as a "default service," i.e., as the service end users get if they do not exercise their rights to choose. A number of states that have deregulated electricity markets allow the incumbent utility (i.e. those that retain a monopoly on distribution services) to pass through SSO marketing and administration costs to customers who shop, thereby subsidizing the SSO.[16] In some states, such as in Pennsylvania and New Jersey, the subsidy has been shown to be as much as $0.0125/kWh for residential customers.[17] Such cost shifting reduces the margin available for CRES providers to profit, and discourages them from entering into the retail market.

[14] For a summary of research on the effects of deregulation on electricity prices, see W. Bowen, E. Hill, A. Thomas, R. Liu, M. Henning, "Consumer price effects of deregulated electric generation markets: The case of Ohio and midwestern United States," Utilities Policy, Vol 83, August 2023, found at: *https://www.sciencedirect.com/science/article/pii/S0957178723001273.* A full analysis of the literature through 2023 can be found therein.

[15] Dormady, et al. (2019). "Who Pays for Retail Electric Deregulation?: Evidence of Cross Subsidization from Complete Bill Data." The Energy Journal, 40(2): 161-194. Dormady, et al utilized electricity bill data from the Public Utilities Commission of Ohio (PUCO) to examine all-in prices. They found that due to rate-setting practices in Ohio, Investor Owned Utilities have been able to recover losses incurred from non-competitive power generating plants through non-bypassable charges placed onto regulated, distribution bills.

[16] F. Lacey, "Default service pricing – The flaw and the fix. Current priced practices allow utilities to maintain market dominance in deregulated markets," The Electricity Journal 32 4-10 (2019), found at: https://www.resausa.org/wp-content/uploads/2022/04/EJ-Cost-Allocation-Article-Published.pdf. The author notes that what had once been called "Provider of Last Resort" has been rebranded as "standard service offer" in most deregulated states, because it is no longer just a default price, but rather the price to beat for retail providers. Indeed, Ohio refers to its standard service offer as the "Price to Compare."

[17] Id.

2

METHODOLOGY FOR COMPARING ELECTRICITY PRICES

To estimate the savings Ohio consumers have realized as a result of deregulation from 2019-2023, the Study Team compared Ohio's average retail price of electricity to the average price of electricity in similar, yet fully regulated, states. First, we used the method of propensity score matching to identify those states that are characteristically similar to each other in terms of influential factors that determine the retail price of electricity. We identified therefrom six Upper Midwestern states for our analysis. Of these, three had deregulated their generation, three had not.[18]

We then compared the price of electricity between the states over time and performed statistical tests to estimate the average difference in these prices between regulated and deregulated states. To make this comparison, the Study Team used data gathered from utilities by the Energy Information Agency (EIA) as part of its annual census of the electric power industry. The EIA collects data on MWh sales and the related revenues that reflect all component costs for electricity delivered to end-use customers, including generation, transmission, distribution and other charges. This data allows for calculation of an average price across all end users, and also by customer class (i.e., Residential, Commercial, and Industrial).

For deregulated states, the EIA data distinguishes between bundled and unbundled types of service. For bundled service, the supply and delivery of energy are both provided by the local distribution utility. These bundled sales align with default, standard service. For unbundled service, the generation-only MWh-sales of supply purchased from alternative retail electric suppliers can be matched to the revenues earned by the local distribution utility for delivering that competitive supply.[19]

The Study Team compared the EIA-derived average retail electricity prices over time and modeled the difference between them for regulated and deregulated states. From this analysis, the Study Team was able to determine an average savings per kWh as a result of deregulation among the six similar Midwestern states.

The average savings among the deregulated states collectively do not, however, tell us what the actual savings in specifically Ohio were as a result of deregulation. To estimate Ohio's savings, we merged Ohio's data for bundled and unbundled service to get a total price per kWh across all customers (not all of Ohio's end users choose to shop).[20] We then undertook the same statistical modeling to compare

[18] Michigan is considered for this research to be fully regulated, although a small portion of it has been deregulated.

[19] Matching the MWh of competitively sourced generation to its delivery is possible at the state level, although not at the distribution utility territory level using the EIA data. The amount of energy-only MWh is exactly equal the delivery-only MWh in the EIA data for each state within a given year. The revenues from generating and delivering that electricity, however, are separately allocated to the competitive supplier and the electric distribution utility, respectively.

[20] Because Ohio's form of deregulation includes the option to choose the SSO, which serves as a safe harbor for shoppers, we determined that the estimate should include all sales in Ohio within the service territories of the four major utilities. However, merging the bundled and unbundled prices in Ohio for this comparison reduced the total savings due to deregulation.

this average "all-in" price in Ohio to retail prices in similarly situated regulated states. We multiplied the resulting rate of savings by the total volume of electricity sold in the service territories of the Investor Owned Utilities in Ohio to estimate the total savings from deregulation.

Some observers have expressed concern that the EIA data does not fully capture all the elements of the total price.[21] The Study Team, however, concluded the EIA data provides a reasonable estimate of the total cost of delivered electricity for the end-use customer. As set forth by the EIA, the average retail price of electricity as derived from Form EIA-861 data includes "all costs for delivered electricity, including generation, transmission, distribution, taxes, fees, etc."[22] The National Association of Regulatory Utility Commissioners (NARUC) characterizes the generation, transmission, and distribution costs reflected in the EIA data as representing the total bill to the end user.[23] As such, the EIA data on operating revenue—and the resulting price per kWh—should include any riders or charges related to transactions between a distribution utility and its affiliates (see Appendix 1). Accordingly, the Study Team concluded that the total costs as determined from the EIA-861 reports provide an appropriate data set for comparing regulated and deregulated total prices.

[21] See, e.g. Dormady, supra fn 14.

[22] https://www.eia.gov/tools/faqs/faq.php?id=507&t=3

[23] https://pubs.naruc.org/pub.cfm?id=5AF87EC9-155D-0A36-31A2-6ACF453362F4

3

OHIO'S COMPETITIVE MARKET

3.1. OVERVIEW OF DEREGULATION IN OHIO

In the 1990s, in response to rising electricity prices and to the success of federal natural gas deregulation, Ohio's commercial and industrial electrical users sought to deregulate Ohio's electricity generation markets. In 1999, Ohio's General Assembly passed Senate Bill 3, which initiated restructuring of the electricity generation in the state. The Bill required electric utilities to enable consumers to choose their electric retail suppliers, beginning in 2001. However, the bill mandated a five-year "market development" period, which froze retail rates while utilities transitioned to a competitive generation market. After "market development" ended, the PUCO extended retail rate freezes through a "rate stabilization period," further delaying the development of a competitive retail energy market.[24]

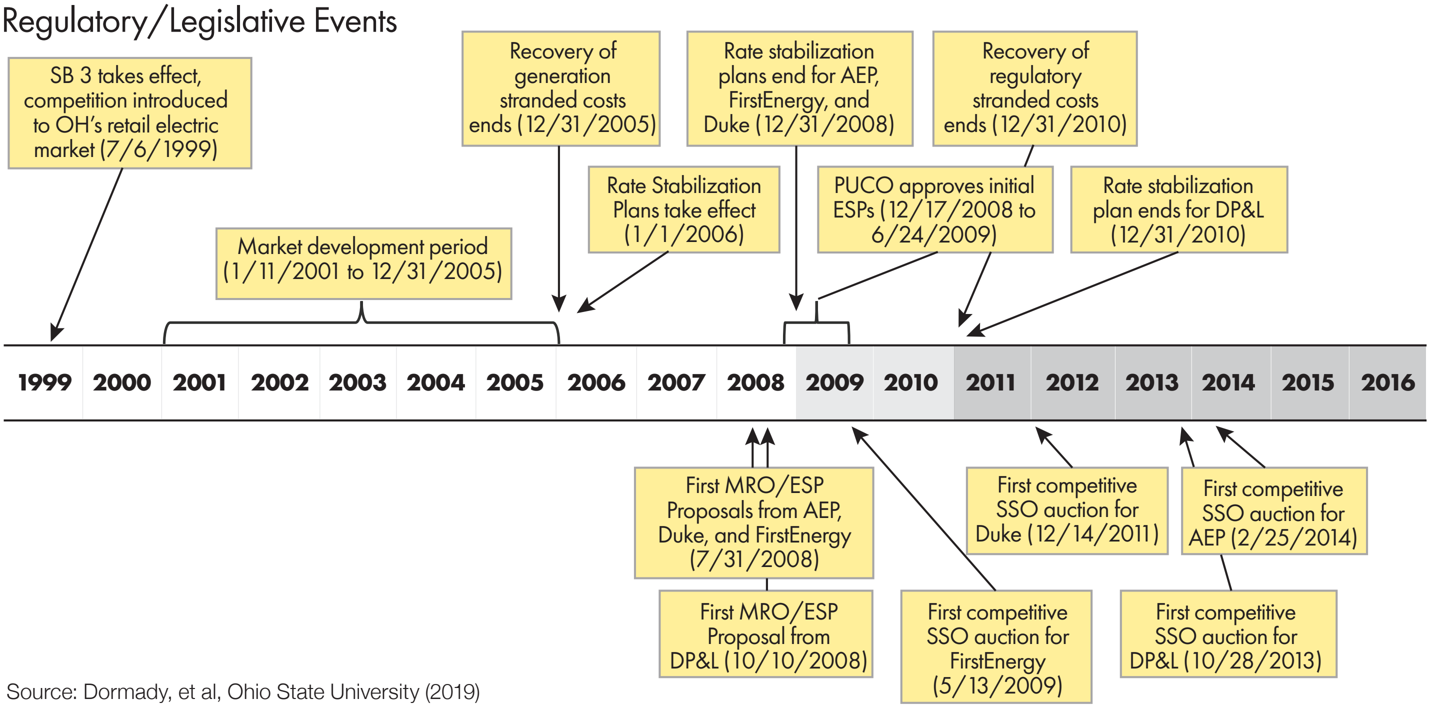
In 2008, Ohio revised its regulatory structure further, introducing market-based ratemaking into Ohio's retail market. Senate Bill 221 required incumbent utilities to remain the "provider of last resort," that is, the supplier that provides default service if a consumer fails to choose an alternative provider. The rate paid by non-shoppers became the utilities' "Standard Service Offer," or, as identified in Ohio, the "Price to Compare" (PTC), which is comprised of the SSO plus some small by-passable riders. The PTC was intended to align with wholesale prices and allow customers to realize the benefits of competition, whether or not they actively shop for electricity.[25] Since 2011, retail electricity markets have grown rapidly in Ohio.

[24] Public Utilities Commission of Ohio. (2007) Electric Rate Stabilization Plans: Ensuring Rate Certainty in Ohio. Retrieved from: http://www.getpurenergy.com/states/forms/Electric%20Rate%20Stabilization.pdf.

[25] See, Dormady, supra fn 14.

FIGURE 3

Ohio Electricity Market Restructuring Timeline



Source: Dormady, et al, Ohio State University (2019)

However, it took several more years before the PTC actually did align with the wholesale market – initially the PTC was set through Electric Security Plans rather than through Competitive Bidding Procedure (CBP) auctions. Between 2011-2014, the utilities finally adopted CBP auctions, and default customers in Ohio finally began to enjoy prices that reflected a competitive generation market. Since 2014, the Investor Owned Utilities in Ohio have mostly used CBP auctions to set the PTC. See Figure 3 above (restructuring timeline).[26]

3.2 PROBLEMS WITH COST SHIFTING IN OHIO FROM GENERATION TO DISTRIBUTION

In 2008, 90% of the sales in Ohio were purchased by defaulting to the SSOs.[27] However, over the following decade, Ohio attracted dozens of CRES providers. By 2018, 79.4% of all electricity sold in Ohio was through CRES providers, accounting for 57% of all electric power customers.[28] That number grew to 84.5% of all MWh sold in Ohio during the first half of 2024.[29]

[26] Dormady, N., Jiang, Z., & Hoyt, M. (2019). Do markets make good commissioners?: A quasi-experimental analysis of retail electric restructuring in Ohio. Journal of Public Policy, 39(3), 483-515.

[27] PUCO. (2019). Retail Market Activity: Switching Rate Percentage (MWh Sales). *https://app.powerbigov.us/view?r=eyJrIjoiMjU1ZWRkNGUtYmJmZS00YTEyLTk5NWYtMGE1NmJmZjYxMzVjIiwidCI6IjUwZjhm Y2M0LTk0ZDgtNGYw Ny04NGViLTM2ZWQ1N2M3YzhhMiJ9*

[28] Id.

[29] Id.

But while the percentage of shoppers grew, the margins that CRES providers could make against the PTC was shrinking. By 2018, as a result of the utility CBP auctions, the SSO markets had begun to converge with the price retail companies could offer to shoppers. Competition was intense for commercial retail electric service providers to beat not only each other, but also Ohio's Price to Compare.

In the meantime, Ohio's Investor Owned Utilities undertook a campaign to shift costs from their aging generation fleet to their grid distribution costs, the latter of which can be recovered through the regulated portion of the ratepayers' bill. The campaign was successful in part; the cost shifting came initially in the form of riders approved by the Public Utility Commission of Ohio, and later in the form of legislation from the Ohio General Assembly. Since most of the subsidized generation has been bid into Ohio's SSO auction, cost shifting made it more difficult for aggregators and CRES providers to compete with the PTC.

One example of the cost shifting occurred in 2016, when the PUCO agreed to pass through a subsidy to distribution customers for aging coal plants in Ohio and Indiana, regardless whether those customers purchased power from the plants.[30] Likewise, in 2017, the PUCO awarded FirstEnergy a "Distribution Modernization Rider" (DMR) that allowed FirstEnergy to collect around $200 million per year for activities that were unrelated to the distribution grid. In 2019, the Ohio Supreme Court ruled that the DMR was an unlawful cross subsidy, and ordered the PUCO to remove the DMR from FirstEnergy's electric security plan.[31]

In 2019, Ohio utilities made a bolder move to undermine retail electricity markets: they sought a massive subsidy for their underperforming nuclear and coal power fleets. Ohio House Bill 6 was passed and signed into law in July 2019.[32] The law included an estimated $1.2 billion in subsidies for FirstEnergy's nuclear generation fleet, plus another estimated $1 billion in coal plant subsidies, among other changes to the law. [33] The nuclear power subsidy portion of House Bill 6 was later repealed after it was discovered that FirstEnergy had engaged in a massive $60 million illegal bribery and corruption scheme with the Ohio House Speaker to get the law passed. However, while the nuclear subsidies were later repealed, coal subsidies remain in effect as of September 2024.[34]

It is unclear what effect the cost shifting has had on Ohio's Standard Service Offers, or how much damage the cost shifting has done to Ohio's deregulated markets. It should be noted, however, that Ohio is not the only deregulated Midwestern state to subsidize its generation. Illinois subsidizes its nuclear power generation.[35]

---

[30] The Investor Owned Utilities were also successful in getting the Ohio General Assembly to propose bailouts through HB 239 and SB 155, which were never passed.

[31] *https://www.brickergraydon.com/insights/publications/Ohio-Supreme-Court-decides-FirstEnergy-grid-modernization-rider-unlawful*

[32] Pelzer, Jeremy. (2019). Ohio lawmakers prepare bill that would raise electric bills to rescue nuclear plants. Cleveland.com. Retrieved from: *https://www.cleveland.com/politics/2019/04/ohio-lawmakers-prepare-bill-that-would-raise-electric-bills-to-rescue-nuclear-plants.html*

[33] K. Kowalski, "Ohio coal plant subsidies still a bad deal for ratepayers, despite growing energy demand," Energy News Network, August 21, 2024 (through 2030, citing Ohio Manufacturer's Association research), *https://energynews.us/2024/08/21/ohio-coal-plant-subsidies-still-a-bad-deal-for-ratepayers-despite-growing-generation-demand-experts-say/?utm_medium=email*

[34] Id.

[35] https://www.reuters.com/world/us/illinois-senate-close-providing-lifeline-3-nuclear power-plants-2021-09-13/fn 14.

4 TRENDS IN OHIO ELECTRICITY PRICES

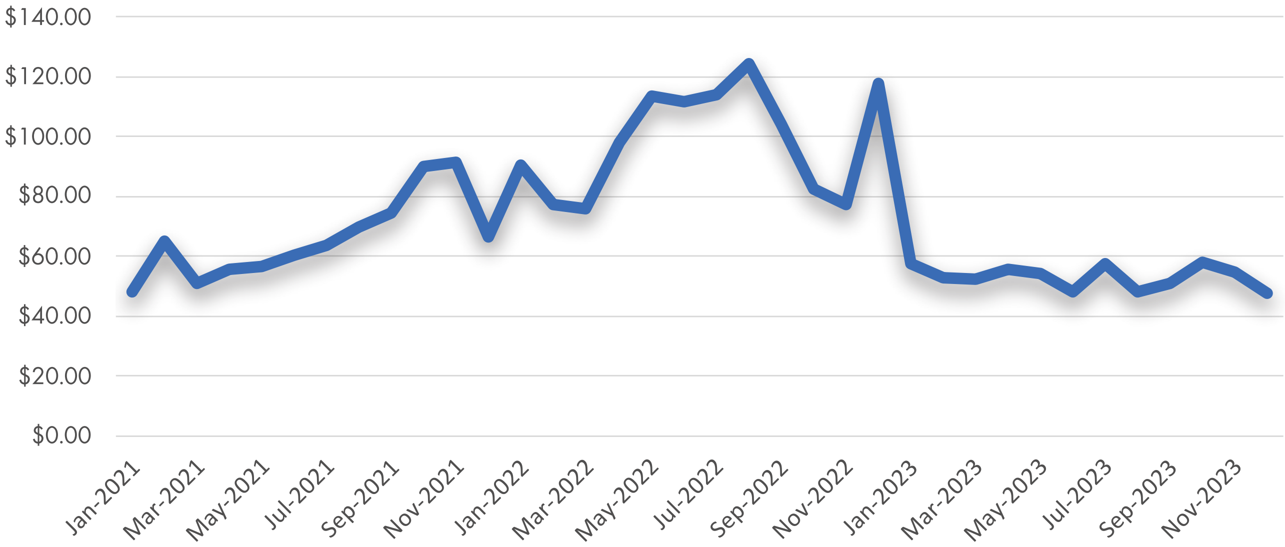
4.1 VOLATILE ELECTRICITY PRICES AND MIGRATION BETWEEN SHOPPING AND SSO

In the decade prior to the 2020 pandemic, electricity prices in Ohio experienced relatively modest price variability. The principal reason for this: decreasing costs in generation had largely offset increasing costs in transmission and distribution. Deregulation, combined with the recession and shale gas development, reduced the cost of generation.

Prices became more volatile after the pandemic in 2020. In January 2021, day ahead prices in PJM were around $50/MWh. Supply chain problems emerged during the pandemic exerting upward pressure on the cost of generation, and wholesale prices rose to over $100/MWh. Russia's invasion of Ukraine in February 2022 compounded the problem by triggering a natural gas shortage, which in turn led to surging energy prices.[36] The result was that by August of 2022, wholesale power was up to $124/MWh in PJM.

FIGURE 4

PJM Total Cost of Wholesale Power per MWh



Data source: Monitoring Analytics (2024)[37]

[36] See e.g. N. Chiwaya, "Why Russia's Ukraine Invasion Spiked Energy Prices," NBC News, February 24, 2022. *https://www.nbcnews.com/news/world/why-russia-s-ukraine-invasion-spiked-energy-prices-4-charts-n1289799*

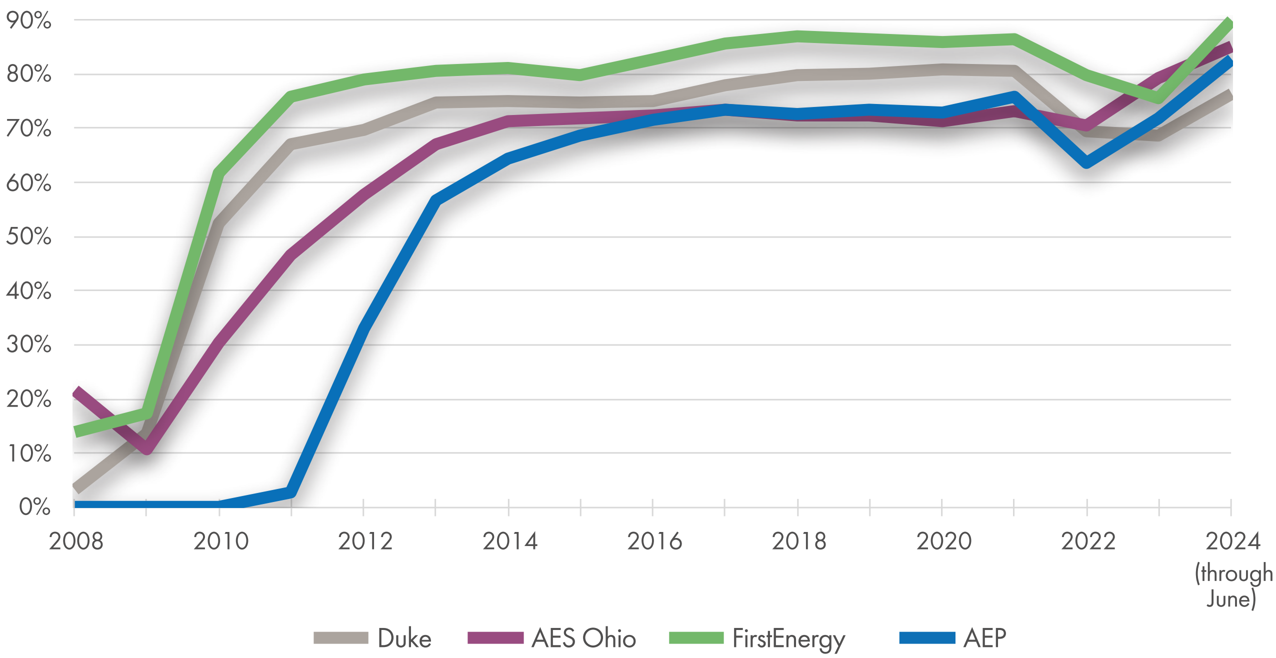
[37] See Components of PJM Price for 2021, 2022, and 2023 at *https://www.monitoringanalytics.com/data/pjm_price.shtml*

But these high prices did not last. By early 2023, it became clear that the Ukraine war would not materially affect natural gas supplies in the U.S., and prices began to drop. Further, mild weather led to increased inventories of natural gas storage in the Northeast and Upper Midwest.[38] As a result, PJM's day ahead prices had dropped back down to around $50/MWh by January 2023.

This price volatility, however, caused rapid migration by customers into and back out of Ohio's SSO, as customers sought relief from the shock of rising energy costs. Since a deregulated generation market first became commercially available in Ohio around 2010, rate payers had over the years increasingly turned to shopping to save money on their electricity bills. Shopping rates in Ohio rose from around 10% in 2010 to over 70% by 2015. That rate continued to gradually rise until 2021, by which time 80% of electricity in Ohio's Investor Owned Utility territories was purchased through shopping. See Figure 5.

FIGURE 5

Percentage of Ohio Energy Sold to Shoppers in Each Utility Territory



Data source: PUCO[39]

[38] See e.g. R. Rapier, "Why Natural Gas Prices Have Collapsed," Forbes, May 19, 2024. https://www.forbes.com/sites/rrapier/2024/05/19/why-natural-gas-prices-have-collapsed/

[39] Id.

That trend reversed after wholesale energy prices spiked in 2021. In 2022, the percentage of shopping in Ohio dropped to 72%. The reason: Ohio's PTC lagged behind PJM's day ahead market, and the PTC offered rate payers a brief safe harbor from rising prices.

Ohio's Standard Service Offers are set by a series of "Competitive Bidding Process" (CBP) auctions held as much as 9 months in advance of the Price to Compare delivery. As a result, Ohio's June 2022 PTC was set by auctions in 2021 – when the PJM wholesale market price was much lower. When wholesale energy prices spiked, the PTC dipped below the price retailers were able to offer.

By 2022, however, new CBP auction prices had increased dramatically in response to market conditions. FirstEnergy's auction of October 2022, held for the first tranche of bidders to supply the SSO for the year beginning on June 1, 2023, cleared at $122.30/MWh.[40] As a result, in the spring of 2023, customers returned to shopping, where they could access PJM day ahead wholesale prices of around $60/MWh. By the first half of 2024, shopping had risen to 85% of electricity sold.

Yet, while wholesale market prices for power generation returned to close to its pre-pandemic levels, the PTC has not yet done so. This is because utilities bidding into the auctions have since begun to account for the risk of customer migration back into the SSO. Prior to 2022, Ohio's PTCs and the electricity forward markets were generally within $5/MWh of each other. By 2024, however, that difference was around $20/MWh.

4.2 TRENDS IN COMPONENTS OF ELECTRICITY PRICE

The price of electricity is comprised of a number of component parts. These include: the purchase price of generated electricity (energy), capacity (generation reserves), transmission, distribution, and a series of regulatory approved add-on charges called "riders." In a deregulated electricity market, only the generating price of power is directly affected by competition. Capacity charges are determined through an auction held by the Regional Transmission Organization, PJM Transmission. As a result, it operates similarly to deregulated generation. Other elements of the cost of electricity remain regulated.

Utilities are able to recover the full cost of their regulated expenditures, plus a return on equity that is typically just under 10%.[41] As a result, utilities that have both generation and distribution in the same market are incentivized to characterize generation costs as distribution whenever possible. This not only ensures a return on investment, it also provides a competitive advantage in bidding generation into the CBP SSO auction or to retail markets. As discussed in Section 1.2 above, SSO administrative costs are commonly passed through to ratepayers as distribution costs for this reason.

The following table provides a high-level overview of the major components of electricity price for a commercial customer in Ohio.

---

[40] See: *https://www.firstenergycbp.com/Results.aspx.*

[41] *https://www.spglobal.com/marketintelligence/en/news-insights/research/underearning-spread-widens-for-gas-electric-utilities-in-roe-analysis*

TABLE 1

Components of Electricity Price

Price Component	Regulated or Deregulated	Description
Energy	Deregulated, not part of Electric Distribution Utility cost	The cost of generating electricity.
Capacity	Auction managed by PJM, not part of Electric Distribution Utility cost	Capacity consists of dedicated generation reserves, designed to "meet the demand for the future" and ensure long-term grid reliability. Capacity costs are determined in a three-year-ahead annual auction.
Ancillary Charges	Managed by PJM, not part of Electric Distribution Utility cost	Ancillary services result from a range of costs incurred by PJM through managing the grid. These charges generally fall into two categories: regulation services, which maintain system frequency, and operating reserves, which provide back-up power in emergency situations.
Line Losses	Not part of Electric Distribution Utility costs	Line losses account for energy that is lost while transmitting electricity along transmission and distribution lines.
Transmission	Regulated, part of Electric Distribution Utility cost	Transmission charges allow utilities to recover the costs of transporting electricity from generating plants to distribution systems as well as the costs of maintaining the grid. All transmission costs are non-bypassable (cannot be avoided through shopping).
Distribution	Regulated, part of Electric Distribution Utility cost	Distribution accounts for the costs of delivery of low-voltage electricity to end-users. These costs are set by state regulators through tariffs. These costs include both distribution and demand charges, and cannot be bypassed.
Non-Bypassable Riders	Regulated, part of Electric Distribution Utility cost	Riders are costs that are assessed with the approval of the PUCO. These charges are numerous, vary in purpose, and traditionally small. However, they have been growing rapidly in recent years. Non-Bypassable riders cannot be avoided by shopping.
Bypassable Riders	Regulated, part of Electric Distribution Utility cost	Bypassable riders are costs generally associated with generation service. Shopping customers can avoid these charges if they shop with a CRES.

4.2.1 TRENDS IN COMPONENT COSTS FOR SHOPPING CUSTOMERS

Each component accounts for a distinct portion of an end-user's retail electricity price. The relative weight of each element has changed since the emergence of competitive markets in Ohio. The cost structure has shifted significantly since the Study Team's previous reports. The Study Team reviewed over 1000 commercial and industrial accounts in Ohio, some mercantile.[42] Figures 6 to 8 below show the changing nature of total electricity price for shopping mercantile customers in Ohio. Mercantile customers are industrial and commercial users that consume greater than 700,000 kWh/year.

FIGURE 6

Approximate Structure of Electricity Price for Shopping Mercantile Users in Ohio, 2016

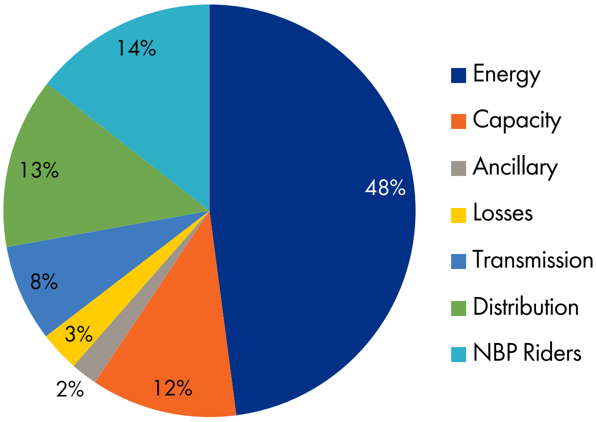


FIGURE 7

Approximate Structure of Electricity Price for Shopping Mercantile Users in Ohio, 2019

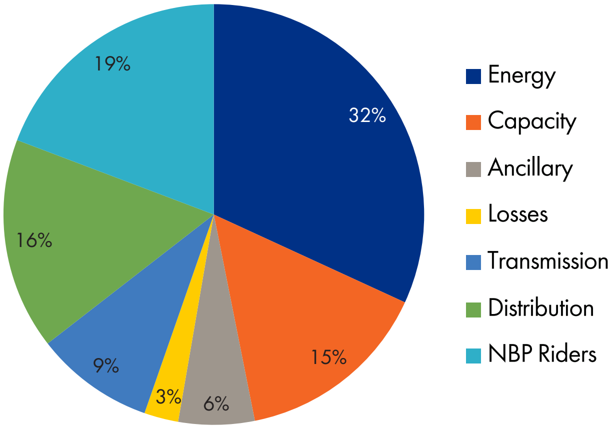
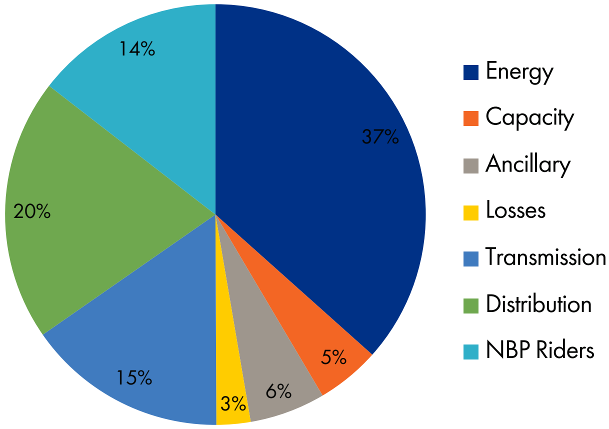


FIGURE 8

Approximate Structure of Electricity Price for Shopping Mercantile Users in Ohio, 2023



Between 2016 and 2023 the energy portion of the total bill decreased by 11 percentage points. This continued an ongoing trend in the makeup of electricity costs for Ohio consumers: as the deregulated (generation and capacity) component of the bill has decreased in response to competitive markets, the regulated (distribution, transportation and non-bypassable rider (NBR)) components have increased in response to Investor Owned Utility petitions to the PUCO.

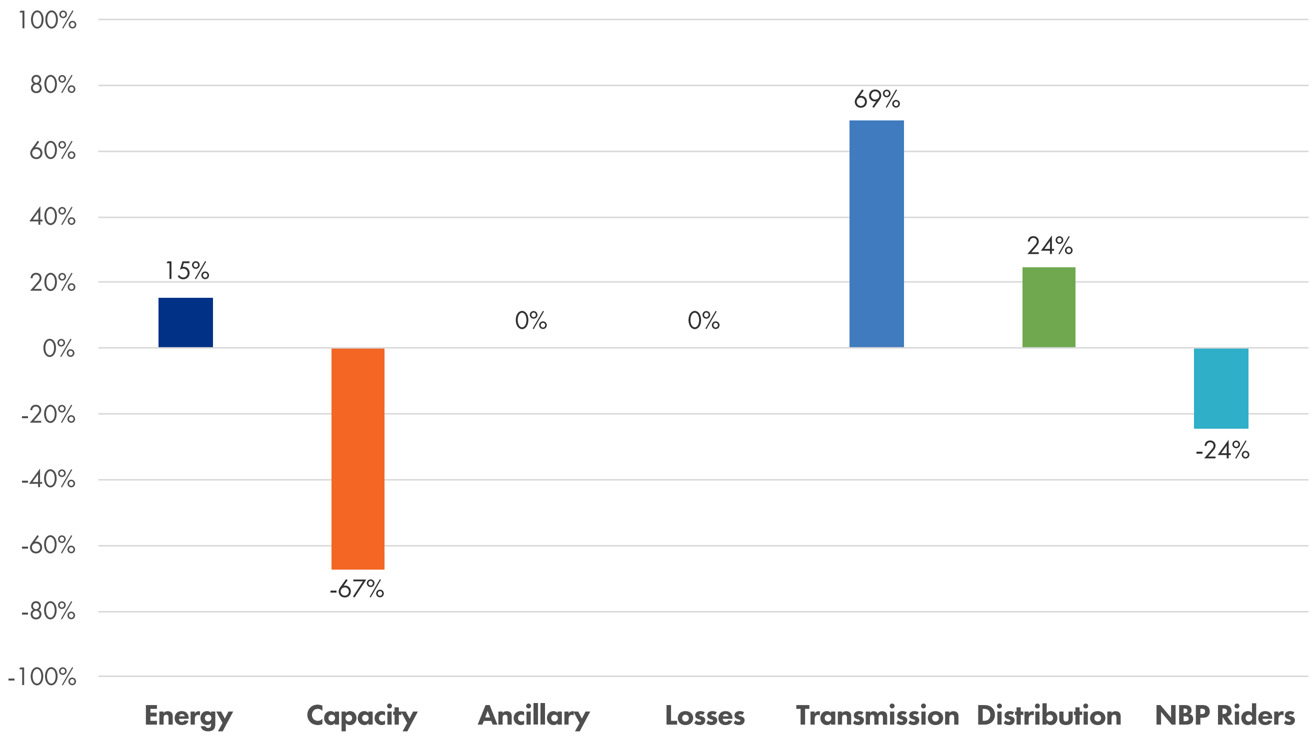
From 2011 to 2018, the regulated components of the price comprised an increasing percentage of the cost of electricity. For ratepayers in AEP and FirstEnergy territories, the regulated portion of the total electricity price jumped 17 and 16 percentage points respectively from 2011 to 2018, offsetting wholly the savings realized from the competitive generation market. In 2019, the regulated portion of electricity was around 43% of the total cost of electricity for mercantile users who shopped. By 2023 this rose to about 49%.

The component trends between 2019-2023 for mercantile users who shop can be summarized in Figure 9.

[42] The average load factor assumed for the mercantile primary rate class was 67 percent, with an average annual consumption, or usage, of 3.3 million kWhs. This load factor was assumed for large commercial and industrial users.

FIGURE 9

Percent Change in Cost Components in Ohio from 2019 to 2023 Secondary Mercantile Markets for Shoppers



These cost components set forth in Figure 9 include the following:

Transmission Charges. Transmission charges went up 69% between 2019 to 2023, the most of any component. Overall, it rose from 9 to 15% of the total cost of delivered electricity in Ohio. Importantly, Ohio has since 2018 changed how its transmission charges are calculated to be based upon peak demand rather than volume. This means that it has become more difficult to bypass transmission charges through net metering programs that support solar or other renewable generation.

Capacity Charges. Capacity charges dropped considerably between 2019 and 2023. Capacity refers to generation reserved for peak load demand. It is managed by the federally regulated Regional Transmission Organization (for Ohio, PJM Transmission) and is set three years in advance through a series of auctions. Large end users are able to manage capacity costs in part by constraining their own demand during periods of peak grid demand. From 2016 to 2018, capacity charges were consistently around 10% of the total cost of electricity. But in recent years, capacity prices were low. By 2023, PJM capacity costs dropped to only 5% of the cost of electricity in Ohio. However recent PJM capacity auctions have dramatically increased projected capacity costs for 2025 and forward, creating a major stir in the electricity market.[43] PJM deferred its next capacity auction to consider the effects its rule changes have had.[44]

[43] See, e.g. E. Howland, "PJM capacity prices hit record highs, sending build signals to generators," Utility Dive, July 31, 2024, *https://www.utilitydive.com/news/pjm-interconnection-capacity-auction-vistra-constellation/722872/*

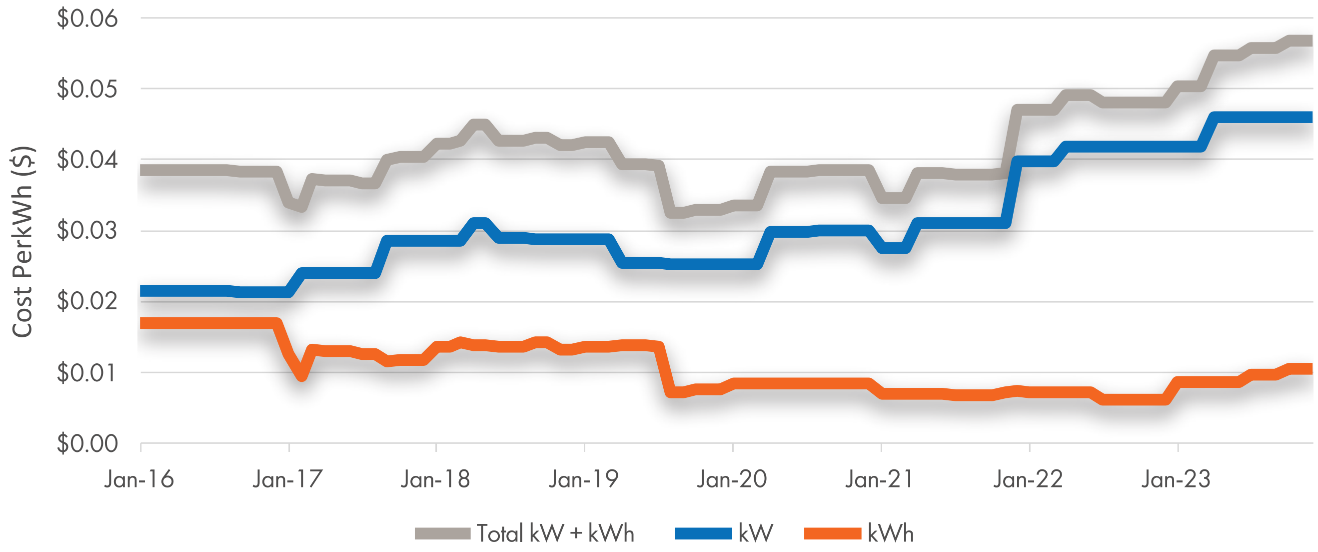
[44] C. Morehouse, "PJM delays capacity auction amid market price controversy," E&E News, October 15, 2024, *https://www.eenews.net/articles/pjm-delays-capacity-auction-amid-market-price-controversy/*

Non-by-passable charges. NBP riders went down by 24% between 2019 and 2023. This reduction was principally the result of the Ohio Supreme Court decision holding that distribution modernization riders were an improper shifting of cost by Ohio distribution utilities from deregulated to regulated prices.

Demand charges. Distribution charges have risen by 24% in the past five years. However, this is due solely to rising demand charges, which are a subset of the distribution charge. Demand charges are based upon a customer's 15-minute interval peak demand. It is, essentially, a standby charge for infrastructure capacity the customer might need. The rest of the distribution charge is based upon the volume of electricity used by the customer. Demand charges have been steadily rising, as utilities have successfully shifted distribution costs from electricity consumption to peak demand. Utilities have sought to shift distribution costs from consumption to demand as a way to undermine the economics of solar power, since demand charges cannot be net metered. But the effects are startling: for example, in AEP's Columbus South Secondary General Services market, demand has gone from around half the total distribution cost in 2016 to over 80% in 2023. Distribution costs have overall risen from around $0.04 to $0.06 between 2016 and 2023, while the volumetric portion of the distribution cost has fallen from around $0.02/kWh to $0.01/kWh. See Figure 10. The interplay between demand and volumetric distribution costs are poorly understood by ratepayers, since the calculation is opaque. But the implications are troubling: rising demand charges are making onsite solar projects increasingly uneconomical.

FIGURE 10

Comparison of Demand (kW) to Volumetric (kWh) Distribution Charges for AEP's Columbus South Secondary General Services Rate



4.2.2 TRENDS IN COMPONENT COSTS FOR NON-SHOPPING CUSTOMERS

For those who did not shop, however, the trend in declining costs for generation, capacity and line losses – the costs that comprise the unregulated portion of the bill for those who do shop – was different. For example, the equivalent to the regulated portion of the cost rose from around 55% in 2010 to around 70% in FirstEnergy's Ohio Edison Secondary SSO. See Figures 11 and 12. This was principally due to the rapid rise in clearing prices for FirstEnergy's CBP auctions beginning in the fall of 2022. As can be seen in Table 2, for non-shoppers the regulated portion of the total cost has returned to 2011 levels.

TABLE 2

Regulated vs. Deregulated Portions of Total Price for Commercial and Small Industrial Customers in 2011, 2019, and 2023[45]

	AEP CS GS3S			FirstEnergy OE Secondary			Duke Secondary		
	2011	**2019**	**2023**	**2011**	**2019**	**2023**	**2011**	**2019**	**2023**
Regulated	32%	49%	33%	31%	47%	28%	29%	35%	28%
Deregulated	68%	51%	67%	69%	53%	72%	71%	65%	72%
Total $/kWh	$0.089	$.099	$0.176	$0.101	$0.102	$0.170	$0.123	$.081	$.129

FIGURE 11

FirstEnergy Ohio Edison Secondary Rate Class Cost Breakdown For Non-shopping Customers, June 2019

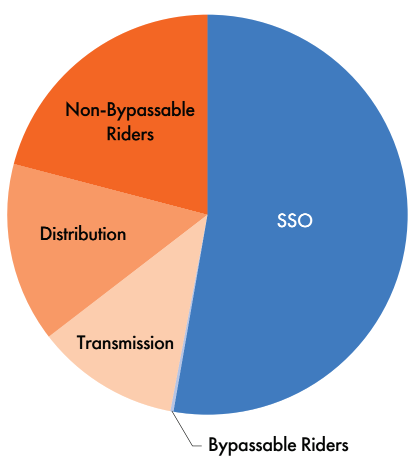
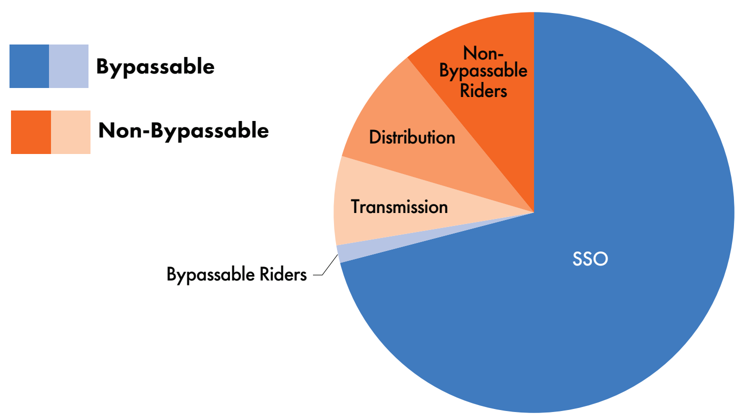


FIGURE 12

FirstEnergy Ohio Edison Secondary Rate Class Cost Breakdown For Non-shopping Customers, June 2023



PTC = SSO + Bypassable Riders

[45] The defining characteristics of a "Secondary" rate class varies by utility. Generally, this rate class includes primarily large commercial users.

5 CALCULATION OF SAVINGS FROM DEREGULATION

5.1 IDENTIFYING SIX MIDWESTERN STATES FOR STATISTICAL MODELING

In our previous studies, we compared six midwestern states, three regulated (Indiana, Michigan,[46] and Wisconsin) and three deregulated (Ohio, Pennsylvania and Illinois). These states are not only in close regional proximity to each other. They are also similar to each other in terms of the factors other than market structure that can influence retail electricity prices. Such factors can include: the cost of fuel used for power generation; electricity demand; electricity generation capacity; electricity generation mix; a state's net imports or exports of electricity; and power system congestion.[47]

We found that a relatively simple model—including five independent or explanatory variables, such as the price of natural gas—has accounted for 71% of the change in retail electricity price from year to year across all states in the contiguous U.S. (see Appendix 2). This small set of influential price determinants was the basis for matching states similar to Ohio. These factors included the price of natural gas and coal as used by the electric power sector; the share of power generation from natural gas; per capita electricity consumption (per capita demand); and the percentage of electricity lost in transmission and distribution. As shown in Appendix 3, we confirmed that the six midwestern states continue to provide an appropriate comparison as they are similar to each other in terms of the drivers of electricity prices that do not include state-level utility regulations.

Figure 13 shows the average electricity price for each of the two groups of Midwestern states in our analysis from 2000 to 2023 across all end-use sectors.[48] The price spread between the two groups began to close starting in 2003, which coincides with when deregulation first became available in the region.[49] As the benefits of deregulation took effect, prices began to converge, until 2011 when the average price in the deregulated states fell below the average price in the regulated group of states. The two distinct price trends provide insight into how deregulation and competition have performed compared to full regulation in the Midwest.

---

[46] Michigan electricity markets were partially deregulated in 1998, and the state is often listed as deregulated in maps, however only 10% of the electricity sales volume is allowed to be sold under deregulated markets. Since most participants are large industrial users, only 0.5% of customers in Michigan have access to deregulated markets. *https://quickelectricity.com/deregulated-energy-states/michigan-energy-deregulation/.*

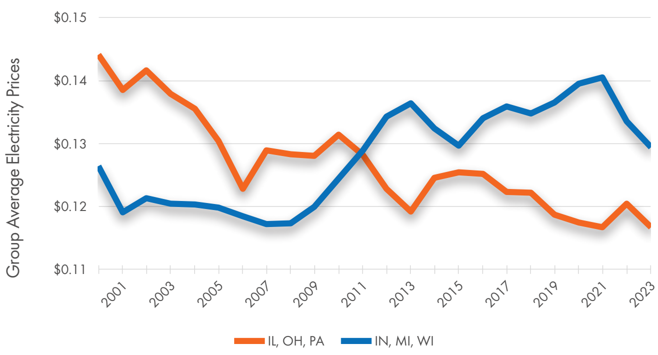
[47] *https://www.eia.gov/energyexplained/electricity/prices-and-factors-affecting-prices.php; https://www.sciencedirect.com/science/article/pii/S036054422200010X; https://www.researchgate.net/publication/306200084_Determinants_of_Electricity_Price_in_Competitive_Power_Market*

[48] For the group of deregulated states, average electricity prices are weighted by the MWh volume of electric generation sold to customers under arrangements made by their electric distribution utility, relative to the MWh of generation instead sold to customers through an alternative (i.e., competitive) retail electric service provider. The EIA-861 data reflected in Figure 13 has allowed for distinguishing between the revenues and MWh sales under these two types of electric generation supply—including the associated delivery of competitively sourced generation—since 2000. See *https://www.eia.gov/electricity/data/eia861/archive/zip/861_2001.zip (instructions). See also https://ees.lbl.gov/publications/non-residential-electricity-prices*

[49] See O'Connor, P. & O'Connell-Diaz, E. (2015). "Evolution of the Revolution: The sustained success of retail electricity competition. COMPETE. Retrieved from: *https://hepg.hks.harvard.edu/publications/evolution-revolution-sustained-success-retail-electricity-competition.*

FIGURE 13

Average Electricity Prices in All Sectors in Six Midwestern States



Data source: EIA (2024). Prices are in real 2023 dollars.

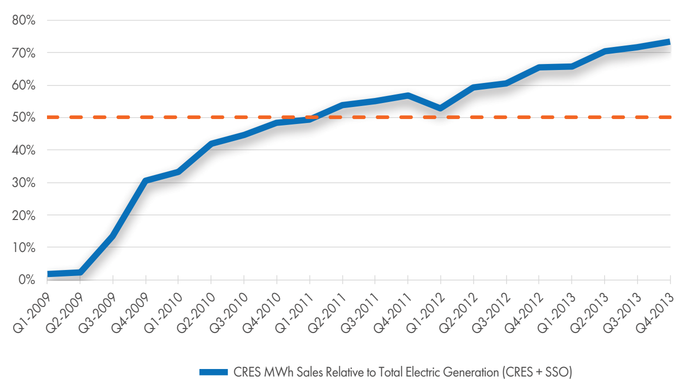
5.2 ANALYSIS OF VARIANCE (ANOVA) AND DIFFERENCE-IN-DIFFERENCE ANALYSIS

To determine the significance of the difference in price between the regulated and deregulated states, we conducted two statistical tests. The first, the Analysis of Variance, measures whether electricity prices significantly increased or decreased over time. The second, the Difference-in-Difference analysis, compares the price of electricity in deregulated states to what it would have been in those same states but for deregulation in generation markets. Competitive markets do not materialize the day after the restructured market regulations are adopted; they require time to develop. Accordingly, an "inflection point" must be identified for when deregulation has begun – a point in time when competitive markets are fully functional.

While deregulation first became available in the Midwest in 2003 with the initial establishment of a regulatory framework for retail electricity competition,[50] competition in earnest—especially in Ohio—did not begin until 2009. This was the year when Ohio adopted new regulations designed to encourage commercial retail electric service (CRES) companies to compete in Ohio. It was also the year that Ohio's utilities first began to conduct competitive SSO auctions. However, as seen in Figure 13, it was not until 2011 that average electricity prices in deregulated Midwestern states crossed below those of neighboring states that retained a regulated market structure. In Ohio, 2011 was also the year when CRES providers began supplying the majority of the state's electric generation (see Figure 14). For our subsequent analyses we therefore considered both 2009 and 2011 as inflection points when competition in electricity generation markets took effect.

FIGURE 14

Percentage of Total Generation in Ohio from CRES Providers by Quarter All End-Use Sectors, 2009-2013



Data source: PUCO Electric Choice Activity Dashboard[51]

[50] *https://hepg.hks.harvard.edu/sites/hwpi.harvard.edu/files/hepg/files/massey_evolution_of_revolution.pdf?m=1523367642*

[51] *https://app.powerbigov.us/view?r=eyJrIjoiZTliZDEzNGEtZjlhYi00YWEzLThjZjktMGZmNDg4OWE4ZDFkIiwidCI6IjUwZjhmY2M0LTk0ZDgtNGYwNy04NGViLTM2ZWQ1N2M3YzhhMiJ9*

5.2.1 ANALYSIS OF VARIANCE

Tables 3 and 4 show the results of a two-way, repeated measures "Analysis of Variance" (ANOVA) test, using 2009 and 2011 as inflection points, respectively. ANOVA addresses whether the average change in electricity price going from before to after deregulation taking effect was any different between the two groups. The ANOVA results, using either 2009 or 2011 as the inflection point, indicate a significant difference in the change in electricity prices for the deregulated states compared to the regulated states at a significance level corresponding to a 99 percent level of confidence.[52] As seen in Tables 3 and 4, after deregulation began to take effect, the average price of electricity in the deregulated states decreased by 1.2 cents/kWh. During the same period, the average price of electricity in the regulated states increased by 1.3 cents/kWh.

TABLE 3

Effects of Deregulation on Average Electricity Prices in the Midwest (2009 as Inflection Point)

Inflection Point: 2009	Regulated States IN, MI, WI Mean (Standard Error)	Deregulated States OH, IL, PA Mean (Standard Error)
Before (2000–2008)	$0.1205	$0.1342
	(0.0005)	(0.0023)
After (2009–2023)	$0.1330	$0.1225
	(0.0014)	(0.0012)

*** Statistically significant at the $p < 0.001$ level. Prices are in real 2023 dollars.

TABLE 4

Effects of Deregulation on Average Electricity Prices in the Midwest (2011 as Inflection Point)

Inflection Point: 2011	Regulated States IN, MI, WI Mean (Standard Error)	Deregulated States OH, IL, PA Mean (Standard Error)
Before (2000–2010)	$0.1211	$0.1333
	(0.0007)	(0.0018)
After (2011–2023)	$0.1345	$0.1214
	(0.0010)	(0.0011)

*** Statistically significant at the $p < 0.001$ level. Prices are in real 2023 dollars.

5.2.2 DIFFERENCE-IN-DIFFERENCE ANALYSIS

For each group of states—those that deregulated generation supply and those that did not—the difference-in-difference model first subtracts the average price of electricity after deregulation began from the average price from before deregulation took effect. This step is done separately for each group and is the first difference. This first difference for the regulated states is then subtracted from the first difference for the deregulated states. This second difference, in conjunction with the first, is a difference in the differences.

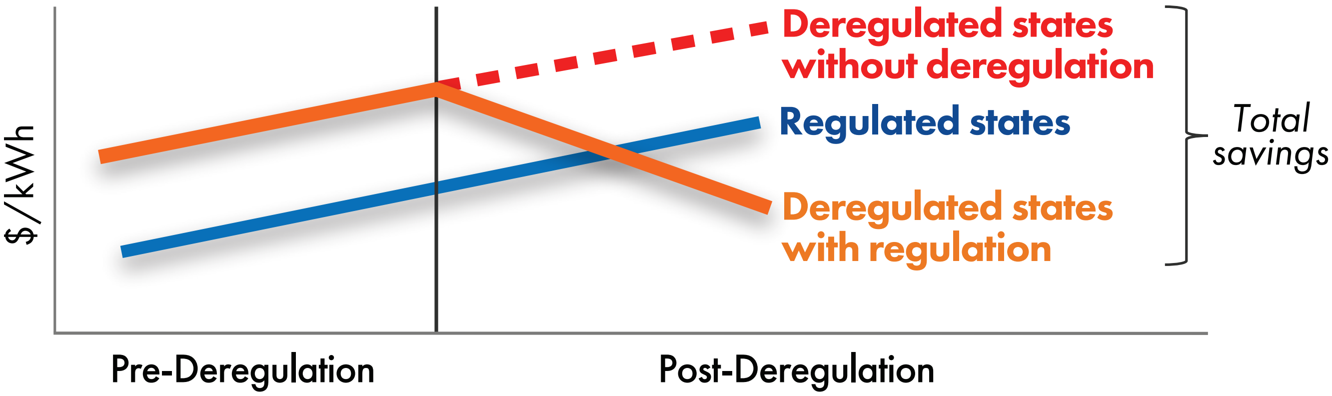
Without some sort of policy intervention, our best guess is that the average price of electricity in deregulated states would have maintained a path parallel to, and higher than, the price of electricity in regulated states. If this were the case, the difference-in-differences would not be significantly different from zero.

Historical cost structures and regulatory regimes tend to put future prices and operating costs on a pre-determined path relative to other states so that the electricity price in any year is closely tied to the previous year's price. The difference-in-difference model removes these path dependencies, estimating the effect of deregulation by isolating it from any differences in average electricity price that may have existed between the two groups of Midwestern states before deregulation took effect (see Figure 15).

[52] Technically, the interaction term between the two variables (a) before-after and (b) deregulated state was significant at $p < 0.001$ using either 2009 or 2011 as the inflection point.

FIGURE 15

Difference-in-Difference Model



This difference-in-difference statistical modeling approach is designed to capture the difference between electricity prices in both regulated and deregulated states (the first difference) before and after competition began (the second difference), and then compare these differences. Table 5 displays the results from the analysis in comparing the two groups of Midwestern states.[53]

Using the 2009 inflection point, the independent effect of deregulation is determined to be a savings of 2.42 cents per kWh, on average, across all rate classes in the three deregulated states. Using 2011 as the year competition took effect, the independent effect of deregulation is 2.54 cents per kWh, on average, across all rate classes in the three deregulated states.

These results are similar to those found in our 2019 study, which looked at EIA data through 2018 and found that the difference after 2009 was around 2.47 cents/kWh (in inflation-adjusted 2023 dollars) between regulated and unregulated markets.[54]

TABLE 5

Average Price per kWh under Two Assumptions for When Deregulation Began

	2009			2011		
	Prices before Deregulation	Prices after Deregulation	Difference	Prices before Deregulation	Prices after Deregulation	Difference
Deregulated States	0.1342	0.1225	0.0117	.1333	.1214	-0.0120
Regulated States	0.1205	0.1330	0.0125	.1211	.1345	0.0134
Difference in Differences			**-0.0242**			**-0.0254**

*** The interaction term was significant at the $p < 0.01$ level in the case of either 2009 or 2011 being the year that deregulation took effect. All prices in 2023 dollars.

[53] The difference-in-difference (DiD) analysis was performed using the xtdidregress command for panel data in the statistical software package Stata. For more on implementing DiD designs in Stata, see *https://www.stata.com/meeting/germany22/slides/Germany22_Luedicke.pdf*

[54] The 2019 study found a difference of 1.96 cents/kWh in 2018 dollars. This converts to 2.47 cents/kWh in 2023 dollars using the Bureau of Labor Statistics' Consumer Price Index for All Urban Consumers: Electricity in U.S. City Average available at *https://fred.stlouisfed.org/series/CUSR0000SEHF01*

5.3 SAVINGS IN OHIO FROM DEREGULATION

To estimate the value delivered to Ohio consumers through deregulation, we estimated where Ohio's price would have been but for deregulation, and calculated the savings therefrom. To do this, we conducted an additional difference-in-difference analysis comparing Ohio specifically to the three regulated Midwestern states using the EIA-861 data. We estimated what Ohio's fully regulated price would have been based on what it was relative to the regulated states before deregulation. Prior to deregulation, Ohio's fully regulated price paralleled the price in the regulated states, while being considerably higher (see Figure 13 above). We subtracted this estimated price from what the price of electricity has actually been in Ohio to calculate the total savings from deregulation.

We determined that 2011 was the appropriate inflection point for when deregulation took effect in Ohio. This is when competitive electric generation first overtook the default supply option of the SSO in terms of MWh sold. This was also the first year after which the rate stabilization period had ended in Ohio (see Figure 3). Rate stabilization, which constrained the volume of deregulated sales, was used in Ohio to ensure that the introduction of competitive markets was measured and unchaotic.

After 2011, the estimated cost difference between electricity prices reported by utilities to the Energy Information Agency (EIA) in Ohio and the deregulated Midwest states was an average of 2.10 cents for each kWh consumed across all end-use sectors.[55] This savings rate is slightly lower than the average rate of savings for all three deregulated states as a group because Ohio's average price of electricity was slightly lower than Pennsylvania's and Illinois's prior to 2011.

This savings estimate was then multiplied by the total kilowatt hours purchased by end-use customers in Ohio from 2019 to 2023. We used an estimate of 2024 electricity purchases as the basis of that year's calculation.[56]

Combining the amounts saved prior to 2019, Ohio ratepayers have avoided an estimated $34.8 billion dollars between 2011 and 2023, for an average of $2.7 billion per year. Table 6 below sets forth by year the estimated savings produced by deregulation from 2011 to 2024.

TABLE 6

Total Savings Due to Deregulated Electricity Generation Markets in Ohio from 2011 to 2024 (millions of dollars)

Year	Total
2011-2018	$21,278
2019	$2,725
2020	$2,612
2021	$2,714
2022	$2,734
2023	$2,702
2024 (est.)	$2,749
Total	**$37,513**

Amounts are in 2023 dollars.

[55] The interaction term between the two variables (a) before-after 2011 and (b) deregulated state in the difference-in-difference model was significant at the $p < 0.01$ level. The estimated rate of savings is in 2023 dollars.

[56] The estimated electric generation purchased by customers for 2024 is based on the total CRES-plus-SSO MWh sales reported on the PUCO's Electric Choice Activity dashboard for the first six months of the year. That amount was doubled to arrive at the estimated total electric generation purchased for all of 2024. Since 2011, the amount of CRES MWh sales reported on the PUCO Electric Choice Activity dashboard has deviated from the amount of unbundled energy-plus-delivery reported for Ohio through the EIA-861 census by less than 1% annually on average. Similarly, the amount of SSO MWh sales reported on the PUCO Electric Choice Activity dashboard has deviated from the amount of bundled full service reported for Ohio through the EIA-861 census by less than 1% annually during this period.

6 UNDERSTANDING SAVINGS FROM DEREGULATION IN OHIO

6.1 TOTAL SAVINGS BY CUSTOMER CLASS

The EIA data used to calculate the rate of savings from deregulation across all end-use sectors also allows for the estimation of savings within each customer class since revenues and MWh sales are reported separately for Residential, Commercial, and Industrial customer classes. A difference-in-difference can therefore be performed to estimate the total savings in Ohio compared to the regulated Midwestern states for each end-use sector.[57] The results of such an analysis, using 2011 again as the inflection point for the period 2000-2023, are shown in Table 7.

The savings rate for each customer class was multiplied by the corresponding electricity supplied to each group. Table 8 shows the resulting savings in Ohio by end-use sector for 2019-2024. For 2024, we used an estimate of 2024 electricity purchases as the basis of that year's calculation.[58]

TABLE 7

Total Savings per kWh by Sector in Ohio Since 2011

End-Use Sector	Savings Rate ($/kWh)
Residential	$0.0251
Commercial & Industrial	$0.0201

*** Interaction terms significant at $p < 0.001$ level in all cases.
All amounts in 2023 dollars.

TABLE 8

Savings Due to Deregulated Electricity Generation Markets by Customer Class from 2019 to 2024 (millions of dollars)

Year		Commercial & Industrial
2019	$1,085	$1,639
2020	$1,085	$1,527
2021	$1,103	$1,611
2022	$1,100	$1,634
2023	$1,035	$1,667
2024 (est.)	$1,037	$1,712
Total	**$6,445**	**$9,790**

Amounts are in 2023 dollars.

[57] The estimate of total savings by customer class reflects savings both from competitive auctions and the avoided costs from shopping. The EIA data distinguishes between generation supply provided as default, standard service, and that which is purchased from alternative suppliers. Electric generation supply via standard service versus an alternative supplier corresponds, respectively, with the EIA's bundled service versus unbundled service, the latter being a combination of energy-only and delivery-only services provided by different companies. See *https://live-lbl-eta-publications.pantheonsite.io/sites/default/files/lbnl-2001203.pdf.* Since 2011, the amount of CRES or SSO MWh sales reported on the PUCO Electric Choice Activity dashboard has deviated from the corresponding amount of bundled or unbundled MWh sales reported for Ohio through the EIA-861 census by less than 1% annually on average.

[58] The estimated electric generation purchased by customer class for 2024 is based on the total CRES-plus-SSO MWh sales reported for Residential, Commercial, and Industrial customers on the PUCO's Electric Choice Activity dashboard for the first six months of the year. The amount for each group was doubled to arrive at the estimated total electric generation purchased for all of 2024.

6.2 AVOIDED COSTS FROM SHOPPING

The avoided costs from shopping is a subset of the total savings from deregulation. Ohio utilities use a competitive bidding process (CBP) auction to set its default price for electricity – the "price to compare" (PTC). Each utility conducts auctions to set their Standard Service Offer, which is then used to set a PTC for each rate class (primary, secondary, residential). The ratepayers can then compare offers from competitive retail electric service (CRES) providers to that PTC. Those who pick the CRES providers (or aggregators) are considered to have "shopped" their load.

CBP auctions obtain far better prices than those made available from regulated, monopoly utilities. For this reason, between 2011-2014, Ohio required its utilities set PTCs by competitive auction instead of traditional cost-basis accounting (see Figure 3). Those savings – which all ratepayers enjoy, regardless whether they shop – are discussed in Section 6.3.

Accordingly, savings from shopping is a subset of the total savings resulting from deregulation. The difference-in-difference model compares Ohio's prices (both bundled and unbundled) to those it would have been, but for deregulation. Savings from shopping, on the other hand, compares the consumers' CRES or aggregator prices to the PTC – the price they would have paid had they defaulted into that market.

The savings from shopping can, nonetheless, be calculated. First, the rate of savings from shopping was estimated for each customer class by subtracting the price-per-kWh for unbundled service in Ohio—which includes the cost of competitive generation—from the price-per-kWh for bundled service pursuant to which a customer purchases generation from its local distribution utility through the standard service offer. This savings rate was then multiplied by the volume of electricity each customer class purchased from competitive suppliers annually from 2019 through 2023 to calculate the savings from shopping during this time.

Table 9 translates these rates of avoided costs due to shopping to estimated total savings based on the MWh of generation sold to customers through competitive retail electric service providers.[59]

TABLE 9

Total Savings through Shopping for Residential and Commercial & Industrial Electricity Customers from 2019 to 2024 (millions of dollars)

Year	Residential	Commercial & Industrial
2019	$44	$1,218
2020	$45	$1,141
2021	$47	$1,207
2022	$44	$1,051
2023	$41	$1,121
2024 (est.)	$50	$1,266
Total	**$271**	**$7,004**

Data source for MWh sales: PUCO Electric Choice Activity Dashboard.
All amounts are in 2023 dollars.

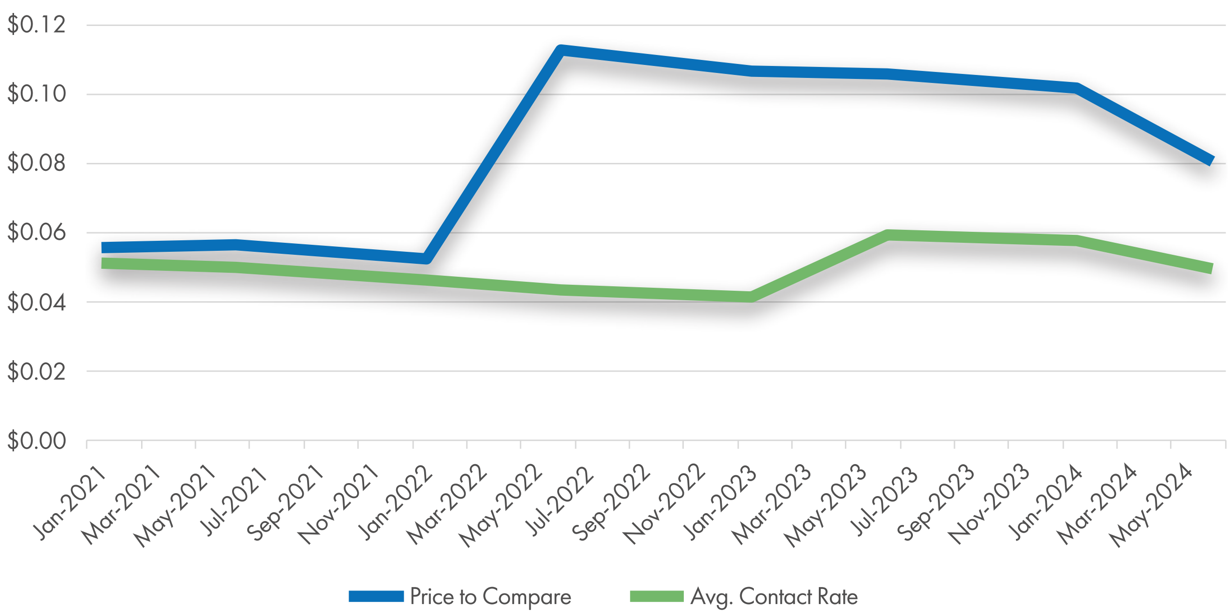
[59] The estimated electric generation purchased by customer class for 2024 is based on CRES MWh sales reported on the PUCO's Electric Choice Activity dashboard for the first six months of the year. The amount for each group was doubled to estimate total electric generation purchased for all of 2024.

Since the volatility in the wholesale market that began in early 2022, suppliers have included a risk premium in their SSO auction bids that has further incentivized shopping. Figure 16 illustrates the difference between the Price to Compare—which is almost entirely determined by the SSO rate—and the average contract rate for competitive supply since 2021 for large industrial users in AES Ohio's service territory.[60] Mercantile (greater than 700,000 kWh per year) customers in AEP, FirstEnergy, and Duke territories have seen a similar increase in headroom—the difference between the Price to Compare and average contract rate—during this period.[61]

However, even before 2022 there were periodic trends of increasing headroom across Ohio's electric distribution utility territories that incentivized increased market participation for shopping mercantile customers. As seen in Figure 16 the discount from shopping for commercial customers under their utility's Secondary rate class approached or exceeded $0.10/kWh at multiple junctures from 2018-2021.[62]

FIGURE 16

Price-to-Compare Versus Average Contract Rate for Large Industrial Users in AES Ohio Territory



Data Source: Scioto Energy (2024). All amounts adjusted for inflation (2023 dollars).

[60] Figure 16 is based on aggregated broker data for mercantile customers under AES Ohio's Primary rate class. Such customers were assumed to have an average load factor of 67 percent, with an average annual consumption of 3.3 million kWh.

[61] Mercantile customers are defined in the Ohio Revised Code as those commercial or industrial customers that consume more than 700,000 MWh of electricity annually. *See https://codes.ohio.gov/ohio-revised-code/section-4928.01.*

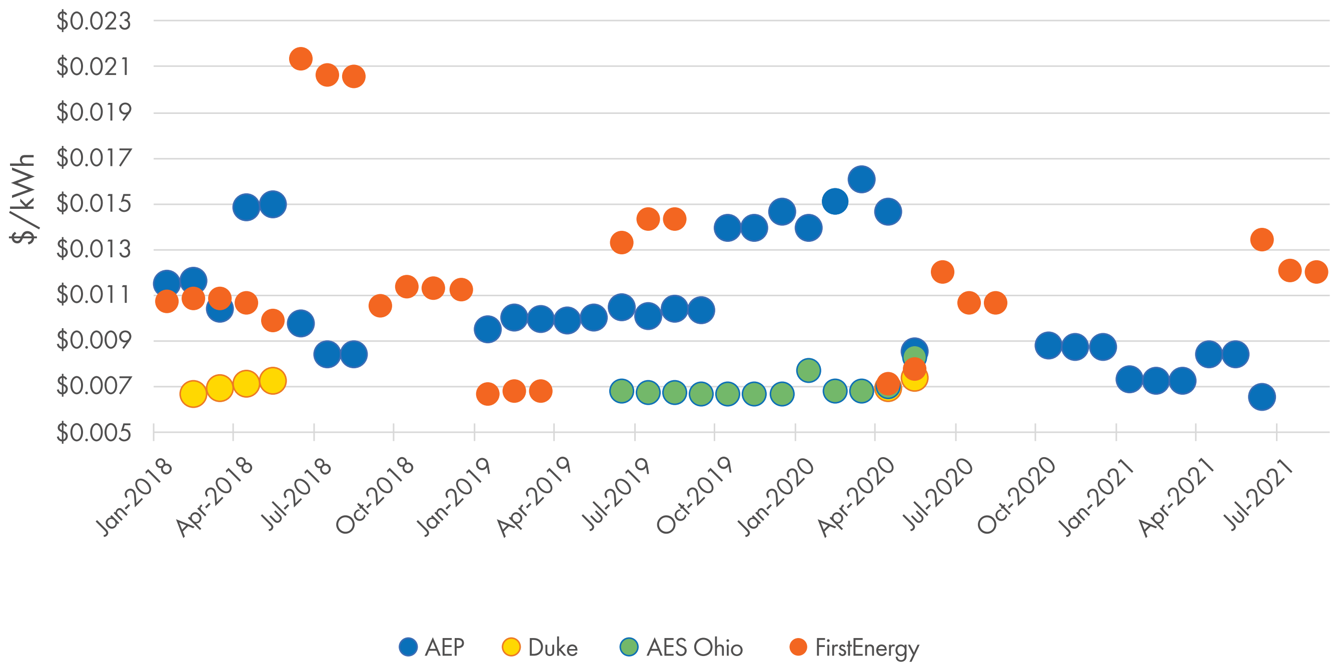
[62] Data for Secondary rate class customers represents aggregated broker data for commercial mercantile customers with an average load factor of 47 percent along and average annual consumption of 1.7 million kWh.

6.3 SAVINGS FROM COMPETITIVE BIDDING PROCESS AUCTIONS

The use of competitive auctions in Ohio to determine the standard service offer, the main component of the Price to Compare, has significantly driven down the cost of electric power purchases since 2011. Residential consumers purchase most of the generation procured through these auctions, as shown in Figure 18. Residential consumers also purchase a relatively much higher amount of SSO-derived generation compared to other customer classes (see Figure 19). Thus, the decrease in the cost of default service provided by the electric distribution utility under standard service offers has largely inured to the benefit of residential customers.

FIGURE 17

Headroom in Ohio Electric Distribution Utility Territories for Secondary Mercantile Commercial Customers Before 2022

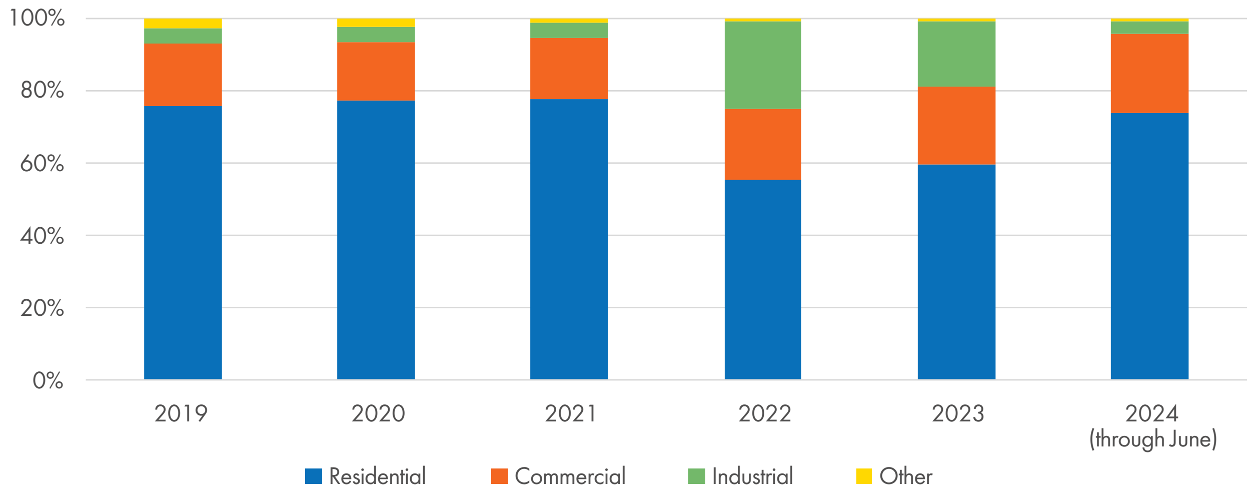


Data source: Scioto Energy (2024). All amounts adjusted for inflation (2023 dollars).

The smaller share of Residential SSO MWh sales in 2022 and 2023, as seen in Figure 18, was due to migration of Industrial and Commercial customers into the SSO. Those customers returned predominantly to shopping in 2024.

FIGURE 18

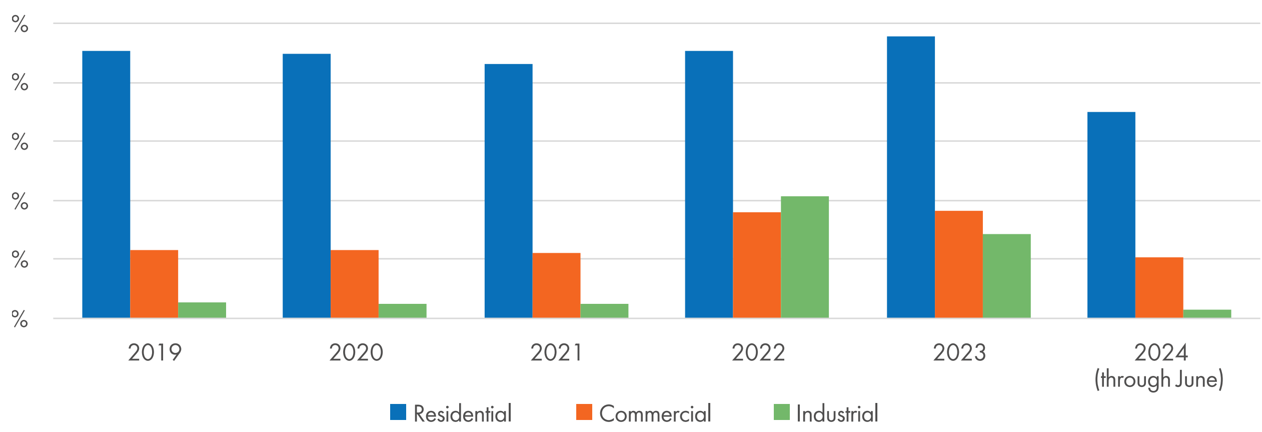
Share of SSO MWh Sales by Customer Class in Ohio



Data source: PUCO Electric Choice Activity Dashboard

FIGURE 19

Percentage of Electric Supply from SSO within Customer Classes



Data source: PUCO Electric Choice Activity Dashboard

Savings from competitive auctions were calculated as the difference between the avoided costs from shopping and the total estimated savings resulting from the difference-in-difference analysis of total savings for each end-use sector (see formula below).

These shares of the savings from deregulation attributable to competitive auctions are shown in Table 10. The combined savings from the CBP auctions plus shopping for 2019 to 2024 are set forth in Table 11.

Total Savings – Savings from Shopping = Savings from CBP auctions

TABLE 10
Savings from CBP Auctions, Not Including Shopping from 2019 through 2024 (millions of dollars)

Year	Residential	Commercial & Industrial
2019	$1,041	$421
2020	$1,040	$386
2021	$1,056	$404
2022	$1,056	$583
2023	$994	$546
2024 (est.)	$987	$446
Total	**$6,174**	**$2,786**

All amounts in 2023 dollars.

TABLE 11
Total Savings Due to Deregulation in Ohio

Year	Shopping	CBP Auction	Total
2019	$1,262	$1,462	$2,725
2020	$1,186	$1,426	$2,612
2021	$1,254	$1,460	$2,714
2022	$1,095	$1,639	$2,734
2023	$1,162	$1,540	$2,702
2024 (est.)	$1,316	$1,433	$2,749
TOTAL	**$7,275**	**$8,960**	**$16,235**

6.4. AVERAGE PER CUSTOMER SAVINGS RESULTING FROM DEREGULATION

As set forth in Table 7, since deregulation took practical effect in 2011, Residential customers have paid $0.0251/kWh less for electricity on average than they otherwise would have had generation markets not been restructured. Likewise, Commercial & Industrial ("C&I") customers in Ohio have paid $0.0201/kWh less during this time frame. These per-kWh savings can be translated to average monthly and annual per customer savings based on the type of customer.

6.4.1. SAVINGS BY CUSTOMER CLASS

Distribution utilities in Ohio classify their customer base according to customer type, such as residential, commercial, and industrial.[63] Utilities report data on the MWh of electricity sold to each customer class to the Public Utilities Commission of Ohio (PUCO). Utilities also report the number of customers that purchased this electricity to the PUCO. This data is available on a monthly basis and allows for the calculation of the average monthly kWh of electricity purchased by customer for each of the three major customer classes.[64]

FIGURE 20. MONTHLY KWH CONSUMPTION PER CUSTOMER 2011-2023 BY CUSTOMER CLASS

Data source: PUCO

From 2011-2023, the average Residential customer in Ohio purchased 868 kWh of electricity per month, the average Commercial customer purchased 6,187 kWh per month, and the average Industrial customer purchased 227,366 kWh per month. The average savings per kWh that EPC estimated for each customer class was applied to the monthly kWh purchased per customer to arrive at an estimate of per customer savings since deregulation took effect in Ohio.

[63] See https://puco.ohio.gov/utilities/electricity/resources/rate-case-process

[64] Data on MWh sales and customer count by customer class available online at the PUCO's Electric Choice Activity dashboard.

TABLE 12. SAVINGS FROM DEREGULATION IN OHIO BY CUSTOMER CLASS FOR 2011-2023

Customer Class	Estimated Monthly Savings	Estimated Annual Savings	Estimated Total Savings
Residential	$21.79	$261.47	$3,399.12
Commercial	$124.36	$1,492.32	$19,400.16
Industrial	$4,570.06	$54,840.68	$712,928.78

All amounts in 2023 dollars.

6.4.2. PER CUSTOMER SAVINGS WITHIN COMMERCIAL AND INDUSTRIAL SECTORS

There can be wide variation in per-customer electricity consumption within the Commercial and Industrial sectors. A hospital, for example, will likely consume much more energy annually than a retail store. The PUCO does not release aggregated data on electricity usage for more detailed user classes, such as subsectors within the broader Commercial and Industrial sectors.

The Study Team used the U.S. Energy Information Agency's most recent Commercial Building Energy Consumption Survey (CBECS) to estimate per building electricity consumption within the Commercial sector. CBECS is a nationally representative sample of the energy-related characteristics of U.S. commercial buildings.[65] Geographically, CBECS provides estimates of annual electricity consumption per building down to the U.S. Census Bureau's Division level. Ohio is located within the East North Central Division, which includes Illinois, Indiana, Michigan, and Wisconsin.

Table 13 provides average annual electricity consumption per building for more specific Commercial activities within the East North Central Division as derived from the CBECS data. The savings per kWh that the Study Team estimated for C&I customers in Ohio was applied to the annual kWh consumed per building to arrive at an estimate of annual per building savings since deregulation took effect in Ohio.

[65] https://www.eia.gov/consumption/commercial/

TABLE 13. ANNUAL SAVINGS FROM DEREGULATION IN OHIO BY COMMERCIAL ACTIVITY FOR 2011-2023

Commercial Activity	Average square feet per building	Average annual kWh per building	Estimated annual savings per building
Grocery store	21,615	1,159,056	$23,297
Fast food/Restaurant	3,766	189,892	$3,817
Hospital	548,085	16,619,879	$334,060
Retail Store	23,799	272,156	$5,470
Non-governmental Office (Administrative; Professional; Financial)(Administrative; Professional; Financial)	15,057	197,551	$3,971
Distribution/Shipping center	69,679	244,269	$4,910
Refrigerated warehouse	183,063	6,976,254	$140,223

All amounts in 2023 dollars.

The public version of EIA's survey of manufacturing establishments corresponding to CBECS does not allow for the calculation of average annual electricity consumption per establishment for more detailed industrial subsectors at subnational geographic levels.[66] However, a commonly accepted rule-of-thumb for categorizing Ohio manufacturers is that those consuming 1 million kWh of electricity annually are considered Small, while those consuming 7.5 million kWh and 100 million kWh of electricity annually are Medium and Large, respectively.[67]

The savings per kWh that EPC estimated for C&I customers in Ohio was applied to the rule-of-thumb for annual kWh consumed by manufacturers according to their size to arrive at an estimate of annual savings per Industrial customer since deregulation took effect in Ohio.

TABLE 14. ANNUAL SAVINGS FROM DEREGULATION IN OHIO BY MANUFACTURER SIZE FOR 2011-2023

Manufacturer Size	Annual Electricity Consumption (kWh)	Estimated annual savings per customer
Small	1,000,000	$20,100
Medium	7,500,000	$150,750
Large	100,000,000	$2,010,000

All amounts in 2023 dollars.

[66] See https://www.eia.gov/consumption/manufacturing/

[67] See https://www.ohiomfg.com/wp-content/uploads/2024/03/SB128-HB-178-ZEN-Analysis-4.20.17.pdf

7

CONCLUSION

In 2019, we projected ongoing savings for ratepayers in Ohio from deregulation of around $3 billion per year. That trend did in fact continue. It did so notwithstanding significant electricity price volatility after the COVID Pandemic arose in 2020. And it continued after 2020, following another price shock in the energy markets caused by the Russian Invasion of Ukraine.

Savings have also continued despite utility efforts to shift costs from their generation fleet to their distribution customers, thereby ensuring themselves additional profits while simultaneously undermining the deregulated electricity markets. Deregulation, once championed by Investor Owned Utilities, continues to face challenges from these same stakeholders, who continue to petition both the PUCO and the Ohio General Assembly for subsidies to bail out their loss-making, aging, uncompetitive generation fleets. These efforts have eroded some of the savings that Ohio's consumers have realized as a result of deregulated electricity generation markets.

Yet, savings continue to be robust. Since 2019, Ohio ratepayers have saved $16 billion. This new study examines an important new time period in Ohio's electricity markets: the pandemic and post pandemic era, during which time U.S. electricity retail markets have been in turmoil. What we have learned is that deregulated markets continue to save ratepayers nearly $3 billion per year – including during the recent period of energy market upheaval.

Deregulation has been a striking success for the Midwestern States of Ohio, Illinois and Pennsylvania. It has kept generation costs low, even as other components of the cost of electricity have risen faster than inflation. In Ohio, this has meant ratepayer savings of some $37 billion since 2011, and $16 billion over the last five years. Ohio projects to continue to enjoy similar savings for the coming years, as long as it does not return to the regulated energy market path its sister states in the Midwest have followed.

APPENDIX 1

Other research on the effects of retail electric deregulation in Ohio has held that average retail prices for electricity derived from EIA data have a downward bias as the revenue component accounts for neither riders nor the amounts on customer bills resulting from transactions with utility-affiliated companies such as subsidiaries, parent companies, and corporately separated energy suppliers.[68] However, the operating revenues from sales that electric distribution utilities report to EIA align with the sales revenues these companies report in a separate annual filing of financial and operational information to the Federal Energy Regulatory Commission (FERC). The sales revenues reported to FERC encompass all costs associated with the procurement and delivery of electricity to end-use customers, including those resulting from any charges outlined in the tariff or from transactions with corporately affiliated companies. As the revenues reported to EIA reconcile with those reported to FERC for the same number of MWh sold in a given year, the Study Team assumed that an average retail price of electricity derived from EIA data accurately represents the "all-in" price borne by ratepayers.

A. Reconciling Revenues Reported to FERC and EIA

In addition to the reporting requirements under the EIA Form EIA-861 annual census, major electric utilities must also annually submit a more detailed financial report with the FERC, also known as FERC Form 1.[69] Electric utilities prepare FERC Form 1 filings in conformity with the FERC's Uniform System of Accounts (USofA). The USofA includes a numbering system corresponding with fundamental accounting categories such as assets, liabilities, income, and expenses, under which all transactions are recognized (See Figure 20).[70]

The following accounts (along with account numbers in parentheses) include the electric operating revenues a utility generates as reported on its FERC Form 1: Residential (440); Commercial and Industrial Sales (442); Public Street and Highway Lighting (444); Other Sales to Public Authorities (445); Sales to

FIGURE 21

FERC Accounting Numbering System

100-199	ASSETS AND OTHER DEBITS.
200-299	LIABILITIES AND OTHER CREDITS.
300-399	PLANT ACCOUNTS.
400-432, 434-435	INCOME ACCOUNTS.
433, 436-439	RETAINED EARNINGS ACCOUNTS.
440-459	REVENUE ACCOUNTS.
500-599	PRODUCTION, TRANSMISSION AND DISTRIBUTION EXPENSES.
900-949	CUSTOMER ACCOUNTS, CUSTOMER SERVICE AND INFORMATIONAL, SALES, AND GENERAL AND ADMINISTRATIVE EXPENSES.

[68] See *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3174939*

[69] A major electric utility is one with greater than 1 million MWh of total annual sales in each of the 3 previous calendar years. See https://*www.ferc.gov/sites/default/files/2020-04/form-1.pdf.*

[70] See *https://www.law.cornell.edu/cfr/text/18/part-101.*

Railroads and Railways; and Interdepartmental Sales (448), which includes amounts charged by a utility's electric department for electricity supplied by it to other utility departments.[71] Together, these accounts represent a utility's total sales to ultimate consumers, both for delivering electricity to end-use customers that was provided by an external CRES provider, and also for electricity procured by a utility via auction that was then delivered to non-shopping customers.

The total sales to ultimate consumers on line 7, pp. 300-301 of a utility's FERC Form 1 is generally equal to what a utility reports for revenues and MWh sales to ultimate customers under Schedule 2, Part C of the EIA-861 census.[72] For example, Duke Energy Ohio reported operating revenues of $979,179,156 on 19,253,982 MWh sold to ultimate consumers (i.e., not for resale) for 2020 on its FERC Form 1 filing.[73] These were the same revenues and MWh in sales the utility reported to EIA for 2020 across its delivery-only and bundled services.[74]

Sometimes the FERC and EIA data do not match exactly, especially with respect to revenues. For example, Ohio Edison reported operating revenues of $1,317,754,737 on 22,511,489 MWh sold to end-use consumers on its FERC Form 1 for 2020.[75] While Ohio Edison reported the same MWh sold to EIA for 2020, the utility also reported $24.6 million less in operating revenue that year for those same sales to ultimate customers on its Form EIA-861.

The difference between Ohio Edison's EIA and FERC reporting for 2020 is accounted for under Schedule 2, Part C, Line 4 of Form EIA-861 where utilities can enter credits and other adjustments.[76] These credits/adjustments include both deferred revenue, and also "refunds to customers resulting from rate commission rulings delayed beyond the reporting year [emphasis added] in which the refunds were originally collected."[77] The Tax Cuts and Jobs Act of 2017 lowered the corporate income tax from 35% to 21%, resulting in excess deferred income tax liabilities for utilities that were to be subtracted from the rate base and returned to ratepayers.[78] For Ohio Edison in 2020, this "deferred excess revenue related to the Tax Cuts and Jobs Act" amounted to the $24.6 million difference in electric operating revenues as reported to EIA and FERC.[79]

The Study Team used the EIA's data for sales to ultimate customers without accounting for adjustments as this represents what customers would have actually paid in a given year. The magnitude of any lagged effects of these adjustments on the ultimate retail price of electricity would likely be rather small.[80]

---

[71] Id.

[72] FERC refers to these electric operating revenues as sales to ultimate consumers while EIA uses the term sales to ultimate customers.

[73] *https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CD437-66E2-5005-8110-C31FAFC91712*

[74] *https://www.eia.gov/electricity/data/eia861/archive/zip/f8612020.zip.* See the Excel spreadsheet titled Sales_Ult_Cust_2020.xlsx in the downloaded zipped folder.

[75] See fn 10, supra.

[76] See fn 11, supra and the Excel spreadsheet Operational_Data_2020.xlsx in the downloaded zipped folder.

[77] *https://www.eia.gov/electricity/data/eia861/archive/zip/f8612020.zip.* See the document titled 2020 EIA-861 Instructions.pdf in the downloaded zipped folder.

[78] See *https://www.spglobal.com/marketintelligence/en/news-insights/research/a-deep-dive-into-tax-law-changes-and-the-u-s-utility-sector.* See also

[79] See fn 11, supra. See p. 450.1, footnote to p. 304, line 42, column (c).

[80] From 2013-2022, the adjustments reported to EIA annually averaged less than 1% of combined operating revenue from sales to ultimate customers for Ohio's six Investor Owned Utilities.

B. Accounting for Riders

FERC's USofA stipulates that utilities are to maintain records so that the revenues and MWh sales recorded in the FERC Form 1 revenue accounts can be made available according to the utility's rate schedule (i.e., tariff).[81] For example, Tables 12 and 13 show the $1,317,754,737 in operating revenues from sales of electricity to end users that Ohio Edison reported to FERC for 2020, broken down both by numbered revenue account and by rate schedule as gathered from pages 300, 301, and 304 of the utility's Form 1 filing.[82]

Each rate schedule includes the entire assortment of riders assessed on either a per-customer or per-kWh basis to recover costs not accounted for in standard

TABLE 15

Ohio Edison Electric Operating Revenues by Numbered Account for 2020

Account	Operating Revenues	Megawatt Hours Sold
(440) Residential Sales	$785,806,876	9,433,698
(442) Commercial and Industrial Sales		
Small (or Comm.)	$383,429,381	5,918,615
Large (or Ind.)	$135,235,344	7,025,505
(444) Public Street and Highway Lighting	$13,283,136	133,671
TOTAL Sales to Ultimate Consumers	$1,317,754,737	22,511,489

TABLE 16

Ohio Edison Sales of Electricity by Rate Schedule for 2020

Rate Schedule	Revenue	MWh Sold
Residential Service:		
RS-Residential Service	$763,412,303	9,356,113
Unbilled Residential	$22,394,573	77,585
Commercial Service:		
GS-General Service Secondary	$368,235,176	5,878,342
POL-Private Outdoor Lighting	$5,082,090	33,754
Unbilled Commercial	$10,112,115	6,519
Industrial Service:		
GP-General Service Primary	$87,010,467	2,443,950
GSU-Gen Service Subtransmission	$16,217,129	788,160
GT-Gen Service Transmission	$28,451,421	3,828,380
Unbilled Industrial	$3,556,327	-34,985
Public Street & Highway Lighting:		
TRF-Traffic Lighting	$831,383	13,692
STL-Street Lighting	$12,172,868	120,342
Unbilled Public St. & Highway	$278,885	-363
Total Billed	**$1,281,412,837**	**22,462,733**
Total Unbilled	**$36,341,900**	**48,756**
TOTAL	**$1,317,754,737**	**22,511,489**

[81] See Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act at *https://www.law.cornell.edu/cfr/text/18/part-101.*

[82] See fn 10, supra.

rates. Table 14, reproduced from Ohio Edison's current electric service tariff, shows the riders and charges associated with each rate schedule for which the utility reports revenues on its FERC Form 1 filing.[83] These are the same riders and charges for generation, transmission, and distribution as listed for Ohio Edison on the PUCO's Ohio Utility Rate Survey Dashboard for July 2024 under the Bill Components menu.[84] (The majority of the generation-related riders are bypassable and apply to non-shopping customers.)

TABLE 17

Ohio Edison Current Rate Schedule Summary

	Rate Schedule							
Rider - (tariff sheet no. in parentheses)	RS	GS	GP	GSU	GT	STL	TRF	POL
Advanced Metering Infrastructure / Modern Grid - (106)	●	●	●	●		●	●	●
Alternative Energy Resource - (84)	●	●	●	●	●	●	●	●
Automated Meter Opt-Out - (128)	●	●	●	●	●	●	●	●
Business Distribution Credit - (86)		●	●					
Commercial High Load Factor Experimental TOU - (130)		●	●					
Conservation SupporRider - (133)	●	●						
Consumer Rate Credit - (137)	●	●	●	●	●	●	●	●
County Fairs and Agricultural Societies - (134)		●	●					
Delivery Capital Recovery - (124)	●	●	●	●				
DeltRevenue Recovery - (96)	●	●	●	●	●	●	●	●
Demand Side Managemenand Energy Efficiency - (115)	●	●	●	●	●	●	●	●
Distribution Uncollectible - (99)	●	●	●	●	●	●	●	●
Economic Development - (116)	●	●	●	●	●	●	●	●
Economic Load Response Program - (101)			●	●	●			
Energy Efficiency CosRecovery - (138)	●	●	●	●	●	●	●	●
Experimental Critical Peak Pricing - (113)		●	●	●	●			
Experimental Real Time Pricing - (111)		●	●	●	●			
Generation CosReconciliation - (103)	●	●	●	●	●	●	●	●
Generation Service - (114)	●	●	●	●	●	●	●	●
Hospital NeEnergy Metering - (87)		●	●	●	●			
Legacy Generation Resource - (135)	●	●	●	●	●	●	●	●
Net Energy Metering - (94)	●	●	●	●	●			
Non-Distribution Uncollectible - (110)	●	●	●	●	●	●	●	●
Non-Market-Based Services - (119)	●	●	●	●	●	●	●	●
Partial Service - (24)		●	●	●	●			
Phase-In Recovery - (125)	●	●	●	●	●	●	●	●
PIPUncollectible - (109)	●	●	●	●	●	●	●	●
Reasonable Arrangement - (98)		●	●	●	●			
Residential Distribution Credit - (81)	●							
Residential Electric Heating Recovery - (122)	●							
Residential Generation Credit - (123)	●							
School Distribution Credit - (85)		●	●	●				
Solar Generation Fund - (136)	●	●	●	●	●	●	●	●
State kWh Tax - (92)	●	●	●	●	●	●	●	●
Storm CosRecovery - (139)	●	●	●	●	●	●	●	●
Tax Savings Adjustment - (91)	●	●	●	●	●	●	●	●
Universal Service - (90)	●	●	●	●	●	●	●	●
Vegetation ManagemenCosRecovery - (140)	●	●	●	●	●	●	●	●

• Rider is applicable or available to the rate schedules indicated

[83] https://www.firstenergycorp.com/content/dam/customer/Customer%20Choice/Files/Ohio/tariffs/OE-2024-Electric-Service.pdf

[84] https://puco.ohio.gov/utilities/electricity/resources/ohio-utility-rate-survey

C. Accounting for Transactions with Affiliated Companies

Under the USofA, utilities are required to accurately account for all transactions with associated or affiliated companies in FERC Form 1 filings.[85] Such associated/affiliated companies are those "companies or persons that directly, or indirectly through one or more intermediaries, control, or are controlled by, or are under common control with, the accounting company."[86] For example, AEP Energy, a CRES provider in Ohio, is an affiliate of the Ohio Power Company (AEP Ohio).[87] AEP Energy, doing business as AEP Energy Partners, has regularly participated in Ohio Power's wholesale auctions and been awarded tranches of the distribution utility's SSO load.[88]

In 2022, as reported in its FERC Form 1 filing for that year, Ohio Power purchased 223,754 MWh from AEP Energy Partners through the SSO auction, at a total cost of $9,846,389.[89] This cost is recognized as an expense under account number 555 of the USofA.[90] Other expenses incurred by Ohio Power resulting from transactions with affiliated companies, along with the associated numbered expense account, appear on p. 429 of the utility's FERC Form 1 filing.[91] These amounts are included in the total expense accounts for operations and maintenance that are then subtracted from operating revenues in the calculation of the utility's net income.[92]

---

[85] See fn 77 supra.

[86] Id.

[87] *https://www.aep.com/about/businesses/aepenergy*

[88] *https://elibrary.ferc.gov/eLibrary/filedownload?fileid=AC4F7053-E43A-C36E-9054-87768C000000. See "Ohio Auctions" on pp. 122-123.*

[89] Id. See Purchased Power, pp. 326-327.

[90] Id.

[91] Id.

[92] Id. See Electric Operation and Maintenance Expenses, pp. 320-323. See also Statement of Income, pp. 114-117.

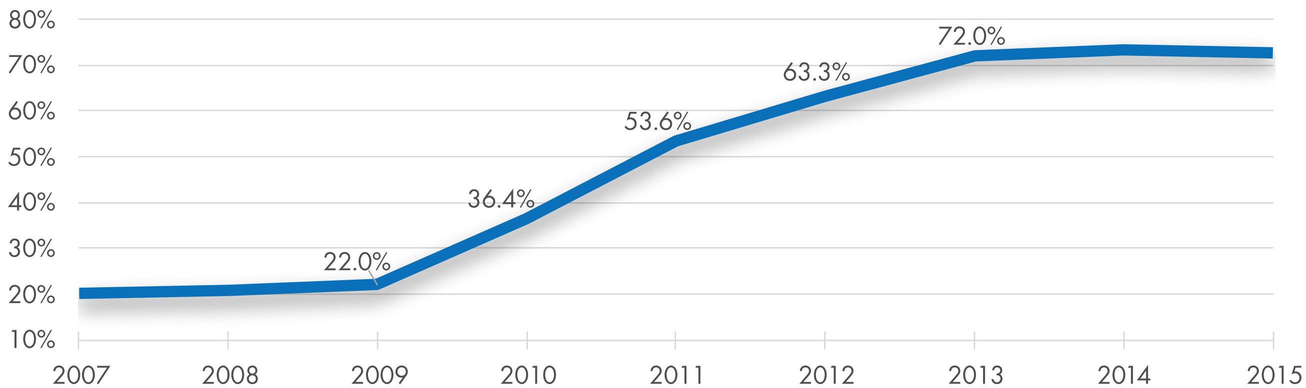
APPENDIX 2

The Study Team identified a small set of factors—other than the adoption of competitive retail supply—that explain a large portion of the variation in average retail electricity price as aggregated at the state level across all end-use sectors. Candidate variables came from a literature review of electricity price determinants.[93] An iterative process of stepwise regression was performed where average electricity price was regressed on a set of predictors. The average electricity price used for this identification process was derived from data for revenues and megawatt-hour sales from bundled service as reported by electric distribution utilities on Form EIA-861 as part of the EIA's annual census of the electric power industry.[94]

The data used to identify determinants of electricity price was for the 48 contiguous states from 2011-2022. The year 2011 marks an inflection point where not only did electric choice start to represent more than half the electric generation supply for the deregulated Midwestern states, but also where the increasing market share for competitive supply began slowly leveling off for these three states (see Figure 21). The year 2022 is the most recent year for which all price determinant data is available.

FIGURE 22

Electric Choice as a Percentage of All Generation Supply in IL, OH, and PA[95]



[93] *https://www.eia.gov/energyexplained/electricity/prices-and-factors-affecting-prices.php; https://www.sciencedirect.com/science/article/pii/S036054422200010X; https://www.researchgate.net/publication/306200084_Determinants_of_Electricity_Price_in_Competitive_Power_Market*

[94] For "bundled" service, both the procurement of supply and the delivery of energy are provided by the same company. This represents standard or default service for states such as IL, OH, and PA. See Form EIA-861 Instructions at https://www.eia.gov/electricity/data/eia861/zip/f8612022.zip.

[95] The EIA-861 census has included data for "unbundled" service since 2001. This data encompasses revenues and MWh sales for two types of services: energy sold by competitive retail suppliers without delivery; and the delivery of this competitively sourced energy by the local distribution utility. For a given state within a given year, the MWh of energy reported in the EIA-861 data is equal to the MWh of delivery, and thus should not be double counted in any calculations. The percentages appearing in Figure 21 reflect this unbundled electricity as a share of total end-use electricity supplied for IL, OH, and PA combined. See https://ees.lbl.gov/publications/non-residential-electricity-prices

Table 15 shows the regression results, while Table 16 describes the variables that were retained for the final regression model.[96] All prices were converted to 2023 dollars prior to the analysis.[97] Across regulated and de-regulated states, the five factors listed in Table 15 explain about 71% of the movements in average electricity price since 2011. The low variance inflation factor (VIF) scores associated with the price determinants indicate that none of the ones listed provide redundant information in explaining variations in the average price of electricity over time.[98]

TABLE 18
Modeling Average Price of Electricity

Variable	Parameter Estimate (SE)	VIF
coal_fuel_price	1.394*** (0.1154)	1.34
nat_gas_fuel_price	0.148*** (0.0491)	1.03
nat_gas_mix_pct	0.0202*** (0.0044)	1.48
res_sales	-0.904*** (0.0410)	1.08
losses_pct	0.118** (0.0489)	1.22
Constant	16.46*** (0.696)	
Observations R-squared Adj. R-squared	576 0.711 0.709	

*** p<0.01, ** p<0.05, * p<0.1

[96] A post-regression analysis of the residuals found that they were normally distributed but suffered from non-constant variance. The standard errors in Table 15 are robust to violating the assumption of constant variance. An autocorrelation function (ACF) plot of the residuals indicated that they were randomly distributed at a significance level corresponding with 95% confidence.

[97] The amount paid by end users for electricity was converted to 2023 dollars using the Consumer Price Index for All Urban Consumers: Electricity in U.S. City Average, available at https://fred.stlouisfed.org/series/CUSR0000SEHF01. The cost of natural gas as used for power generation was converted to 2023 dollars using the Producer Price Index by Commodity: Fuels and Related Products and Power: Natural Gas, available at https://fred.stlouisfed.org/series/WPU0531. The cost of coal as used for power generation was converted to 2023 dollars using the Producer Price Index by Commodity: Fuels and Related Products and Power: Coal, available at https://fred.stlouisfed.org/series/ WPU051

[98] One of the most common rules of thumb is that VIFs greater than 10 are indicative of problematic correlation between predictors in a regression model. See https://link.springer.com/article/10.1007/s11135-006-9018-653.6%

TABLE 19

Determinants of Average Electricity Price

Abbreviation	Description	Data Source
coal_fuel_price	$/MMBtu fuel price for coal as used by the electric power sector	EIA State Energy Data System (SEDS)
nat_gas_fuel_price	$/MMBtu fuel price for natural gas as used by the electric power sector	EIA State Energy Data System (SEDS)
nat_gas_mix_pct	Share of net generation within the state from natural gas	EIA-923 Power Plant Operations Report
res_sales	MWh sales per customer in the Residential sector	EIA-861 Annual Electric Power Industry Report
losses_pct	T&D losses as a percentage of the electricity transmitted and distributed	EIA State Electricity Profiles

APPENDIX 3

The method of propensity score matching was used to identify states similar to Ohio with respect to the determinants of average retail electricity price outlined in Appendix A. The propensity score is the conditional probability of receiving a treatment—in this case the adoption of competitive generation supply—given a set of predictors.[99] Propensity scores for the 48 contiguous states for each year from 2011-2022 were estimated using probit regression for panel data that regressed the treatment assignment on the set of determinants of average electricity price.[100]

As a propensity score is a probability, its value can range from 0 to 1. States with similar propensity scores are similar to each other in terms of the determinants of average electricity price identified in Appendix A. The Jenks natural breaks method was used to group the propensity scores of states into similar classes.[101]

States were grouped into one of five categories—from most to least similar to Ohio—based on the mean absolute difference in their propensity scores relative to Ohio after 2018, which was the last year for which data was available when the last investigation of Ohio's deregulated electricity markets was undertaken by the Study Team in 2019. (See Table 17.)

The use of propensity score matching in conjunction with the Jenks classification algorithm indicates that Ohio is either similar or very similar to Illinois, Indiana, Michigan, Pennsylvania, and Wisconsin with respect to the five factors identified in Appendix 2 that together explain a large share of the movements in average electricity price.

TABLE 20

Mean Absolute Difference in Propensity Scores for Midwestern States Relative to Ohio, 2019-2022

Abbreviation	Range in Mean Absolute Difference from Ohio	Midwestern States (mean absolute difference from Ohio)
Very similar to Ohio	0.001 to 0.053	MI (0.016); WI (0.023); PA (0.035)
Similar to Ohio	0.062 to 0.140	IN (0.062); IL (0.070)
Moderately similar to Ohio	0.195 to 0.222	N/A
Slightly similar to Ohio	0.239 to 0.270	N/A
Not similar to Ohio	0.280 to 0.348	N/A

Ohio's mean propensity score for period: 0.476

[99] See https://www.sciencedirect.com/topics/economics-econometrics-and-finance/propensity-score.

[100] A probit model was fit to the panel data using the command xtprobit in the statistical software package Stata. The propensity score is the predicted probability of a state receiving the treatment of adopting competitive generation supply given the set of predictors in the model.

[101] The Jenks algorithm is a standard method for dividing data into homogenous classes by grouping similar values together while maximizing the differences between classes. See https://pro.arcgis.com/en/pro-app/latest/help/mapping/layer-properties/data-classification-methods.htm

NOPEC (Northeast Ohio Public Energy Council) is a collaborative council of over 240 communities in 19 Ohio counties that negotiates exclusive energy rates for its members. As Ohio's largest governmental retail energy aggregator, NOPEC buys gas and electricity in bulk to help lower customers' utility bills. Since 2001, NOPEC has saved residents and businesses hundreds of millions of dollars on their energy costs, awarded more than $53 million in energy-efficiency grants to NOPEC member communities and helped protect Ohio consumers by advocating for consumer-friendly energy policies to protect against unfair utility rate increases. For more information about NOPEC, visit www.nopec.org.

NOPEC
Northeast Ohio
Public Energy Council

31360 Solon Road, Suite 33 • Solon, Ohio 44139
nopec.org