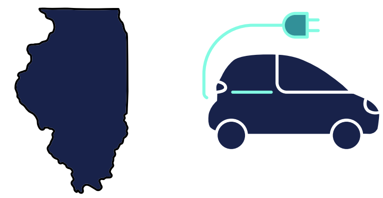
Electric Vehicles Are Driving Rates Down for All Customers



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State Factsheet: Illinois

Electric vehicle drivers in Illinois contributed $18 million more to utilities than their associated costs to the grid over the past 11 years, driving electricity rates down for all customers.

Electric vehicles (EVs) offer a key opportunity to reduce harmful emissions and save consumers money at the same time. EVs are responsible for far fewer greenhouse gases and local air pollutants than conventional vehicles[i] and become cleaner as more renewable electricity is added to the grid. In addition, EVs are generally much cheaper to operate than conventional vehicles.[ii]

The number of EVs on the road is rapidly increasing. By the end of 2023, more than 121,000 EVs had been sold in Illinois.[iii] Federal, state, municipal and industry action to increase EV adoption will continue to accelerate this clean vehicle transition.[iv] The new electricity load and flexible demand represented by these vehicles has major implications for our future energy system and could increase total electricity use by 25 percent across the United States.[v] By charging during hours of the day when there is least demand on the grid, the electric vehicle transition could reduce electric rates for everyone.

Evaluating the impact of electric vehicles on the road today can help us understand their effect on the grid and how they might shape the power system in the future. Accordingly, this analysis examines costs and revenues associated with EVs between 2011 and 2021 in Illinois. **We observe that over the 11-year period, EV drivers in Illinois have contributed approximately $18 million more than their associated costs, driving rates down for all customers.**

How Are EVs Affecting Electricity Rates?

Recent growth in EV adoption has raised the question of how EVs affect the electricity rates paid by all households, including those that do not own EVs. This is an important equity question that should be analyzed when determining the role that electric utilities should play in supporting the transition to EVs. Answering this question requires comparing electric utility revenues from EV charging with utility costs associated with serving EV load. If the utility revenues from EVs exceed the utility system costs, then EV adoption can reduce electricity rates for all customers. Conversely, if the costs are greater than the revenues, non-EV owners could end up paying more for their electricity. This effect holds true even though Illinois electric utilities do not have revenue decoupling.[vi] Additional revenue will be accounted for in subsequent rate cases, and even during the time between rate cases, the revenue from EVs may be used to offset higher costs in other areas, delaying the need for a rate increase for utilities without decoupling.

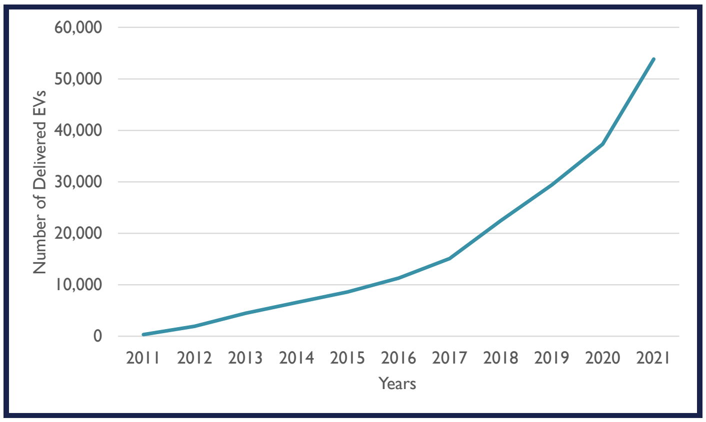
Multiple prospective studies have forecasted that utility revenues will exceed costs with future electrification.[vii] However, to address this question using real-world data, Synapse evaluated the utility system revenues and costs associated with EVs purchased within the last decade across Illinois. Specifically, this analysis tracks revenues and costs associated with roughly 54,000 battery electric and plug-in hybrid EVs sold between 2011 and 2021 in Illinois.[viii]

We analyzed the electricity rates that EV owners pay compared to the marginal cost of providing that electricity (generation, transmission, and distribution costs). We gathered cost and rate data to inform this analysis, including wholesale electricity market data,[ix] filed tariffs,[x] and published marginal cost values.[xi] While managed charging and time-of-use ("TOU") tariffs are becoming the norm across the country, we assume for the purposes of this analysis that most EVs are charging according to a non-managed shape, based on load curves developed by the U.S. Department of Energy.[xii]

Tracking EV Adoption Across the 50 States

In 2011, which was the first year of our analysis, just 300 EVs were on the road in Illinois. By 2021, the number of EVs was roughly 54,000[xiv] – over a 100-fold increase from 2011. Figure 1 shows cumulative EV sales in Illinois. As can be seen in Figure 1, EV adoption rates are accelerating rapidly in recent years. BloombergNEF predicting that EV sales will represent more than half of all car sales by 2030.[xv]

Figure 1. Cumulative EV sales in Illinois, 2011-2021



EV Charging Patterns and Time-of-Use Charging

EVs pull their energy from the electricity grid, but the time of day that the charging occurs defines the cost and carbon content of its power and the impacts on the grid overall. If vehicles charge when demand is already high and electricity is the most expensive, EV could exacerbate grid impacts and costs. If they can take advantage of low overnight demand or plentiful solar power in the afternoon, they can improve the economic and environmental performance of the power system overall.

For this analysis, we assume the majority of EVs are charged at home and mostly in the early evening at the end of the workday which overlaps with typical peak hours. This hourly use pattern was developed by the U.S. Department of Energy ("DOE") and corresponds with real-world data,[xvi] representing charging patterns of EVs not taking service on time-of-use rates (which represents the vast majority of EVs on the road currently).

Time-of-use tariffs affect the costs that consumers pay depending on when they use electricity and can incentivize consumers to use electricity when it is least expensive for everyone (i.e. when there is less overall demand on the grid). We can already see the impact this has on EV charging based on data reported by California's largest investor-owned utilities, where a large number of EVs take service on time-of-use (TOU) tariffs. Figure 2, below, shows the average daily charging curve for EVs on TOU rates in California alongside DOE's national average charging curves for EV owners not on TOU rates. The grey shaded area represents the hours in Illinois when the electric grid peaks[xvii] and when electricity is most expensive.

As Figure 2 shows, the price signals provided by the time-of-use tariff, combined with EV technology that allows for managed charging, shifts typical EV charging from times of peak use to overnight periods, when demand is typically low. These shifts reduce costs to EV owners and operators for charging their vehicles, while also more efficiently using electricity infrastructure and reducing costs for everyone.

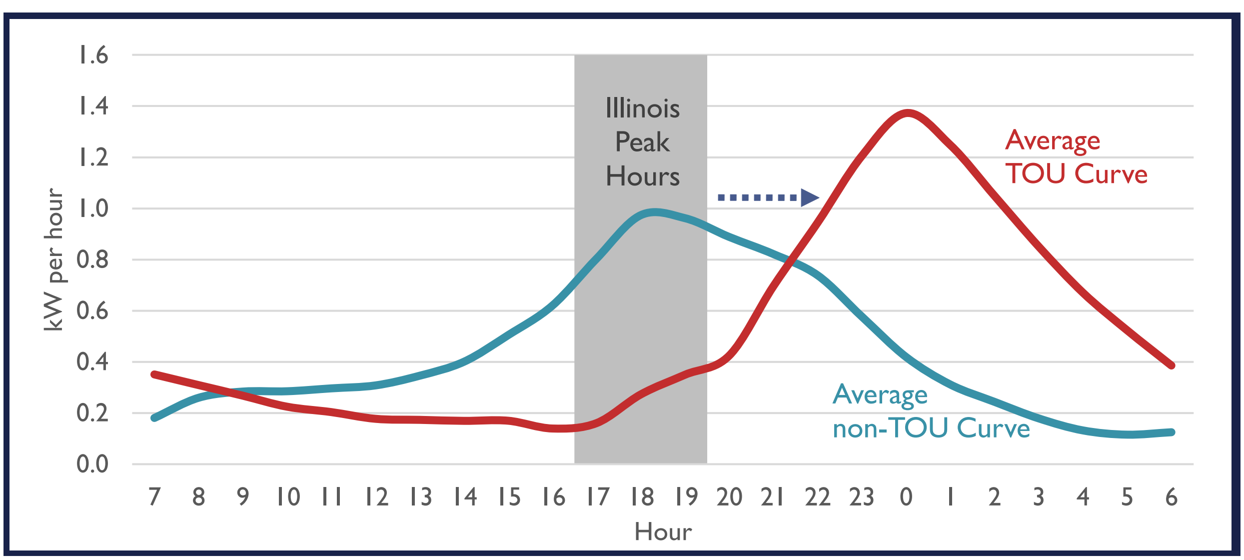


Figure 2. Typical EV charging curve versus the California TOU average EV charging curve, with Illinois peak hours.

Over the last few years, Illinois utilities MidAmerican Energy Company and ComEd have introduced voluntary TOU rates for residential customers, and Ameren Illinois is now offering a residential credit program specifically for EVs that charge during off-peak periods.[1] TOU rates, especially rates designed specifically for EVs, are beneficial for both utilities and customers. Since they can shift the majority of charging away from peak periods, they can help reduce the costs of upgrading the grid while also increasing utility revenues, thereby helping to put downward pressure on rates for all. These types of rates will become especially important as the number of EVs on the roads increase in the coming years.

How does EV charging impact overall electricity rates?

By comparing the revenues generated by EV charging to the utility's marginal cost to serve these EVs, we can construct a picture of whether EVs are creating more revenues than costs (driving costs for everyone down) or creating more costs than revenues (driving costs for everyone up).

The results of our analysis indicate that in Illinois, **EVs have increased utility revenues more than they have increased utility costs, leading to downward pressure on electric rates for EV-owners and non-EV owners alike.** We estimate that EV drivers across Illinois have contributed $18 million *more* in revenues than associated costs, cumulatively between 2011 and 2021 (in 2021 dollars), even with significant amounts of on-peak charging. Figure 3 shows the extent to which revenues from EVs outweigh the generation, transmission, and distribution costs for the period 2011-2021.

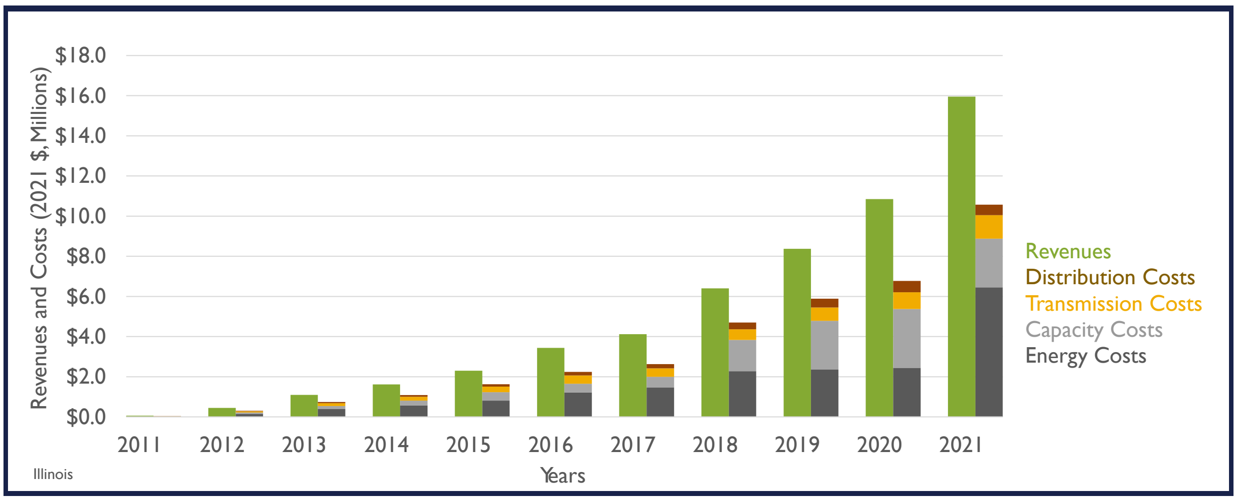


Figure 3. Total costs versus total revenues of EV charging in Illinois per year from 2011-2021.

EVs Can Continue to Put Downward Pressure on Rates

EVs can provide substantial emissions reductions while also helping to reduce electricity rates for all customers by using the system more efficiently. Utilities can play an important role in ensuring that EVs benefit both EV drivers and non-EV drivers alike by encouraging EV customers to enroll in TOU rates and charge during off peak periods. In addition, utility investments that facilitate the deployment of charging infrastructure can accelerate the EV market, growing the potential benefits from widespread EV adoption.

Our analysis indicates that EV adoption in the US has already resulted in more electricity revenues than costs, and future growth in the EV market will lead to further increases in utility revenues. Implementing TOU rates and targeted investments in charging infrastructure can accelerate EV adoption, reducing utility bill costs and harmful emissions for EV and non-EV owners alike.

This factsheet is part of a series of state-specific factsheets, based off a national analysis of the rate impact of EVs. More information can be found at: https://www.synapse-energy.com/evs-are-driving-rates-down

Endnotes

[1] Ameren Illinois' Electric Vehicles Residential Charging Program.

[i] Rocky Mountain Institute (2022). More EVs, Fewer Emissions. Available at: https://rmi.org/insight/more-evs-fewer-emissions.

[ii] Taylor, T., Rosenburg, J. (2022). Total Cost of Ownership Analysis. Atlas Public Policy. Available at: https://atlaspolicy.com/wp-content/uploads/2022/01/Total-Cost-of-Ownership-Analysis.pdf

[iii] Alliance for Automotive Innovation (2023). Advanced Technology Vehicle Sales Dashboard. Data compiled using information provided by S&P Global Mobility and Hedges & Co. Last updated 3/3/2023. Available at https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard.

[iv] See California's requirement that all vehicles sold by 2035 will be plug-in electric vehicles and General Motors' announcement that they will only sell zero-emissions vehicles by 2035.

[v] National Renewable Energy Laboratory (2022). Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States. Available at: https://www.nrel.gov/docs/fy18osti/71500.pdf.

[vi] S&P Market Intelligence. November 12, 2019. RRA Regulatory Focus Adjustment Clauses.

[vii] For example, see: Public Advocates Office, Distribution Grid Electrification Model – Study and Report, 2023, available at https://www.publicadvocates.cpuc.ca.gov/-/media/cal-advocates-website/files/reports/230824-public-advocates-distribution-grid-electrification-model-study-and-report.pdf, and California Public Utilities Commission, Utility Cost and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursueant to P.U. Code Section 913.1, 2021. Available at: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf

[viii] Atlas EV Hub. State EV Registration Data. Available at: https://www.atlasevhub.com/materials/state-ev-registration-data/.

[ix] MISO and PJM energy and capacity data.

[x] Transmission cost data from Edison Electric Institute. 2022. Typical Bills and Average Rates Report - Summer 2021.

[xi] California's Avoided Cost Calculator (developed by E3) were used for distribution costs. We reduced these by 10 percent to mitigate double counting of distribution-related EV program costs.

[xii] The load curve used for years 2011 through to 2020 are from United States Department of Energy, 2017, National Plug-In Electric Vehicle Infrastructure Analysis, Available at: https://www.nrel.gov/docs/fy17osti/69031.pdf. We developed a new average load curve for 2021, using data from DOE's EVI-Pro Lite tool. We took an average of the load curves from each state's largest city, weighted by number of registered EVs per state. Department of Energy, Alternative Fuels Data Center. Data retrieved July 2023. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Available at: https://afdc.energy.gov/evi-pro-lite.

[xiv] Atlas EV Hub. State EV Registration Data. Available at: https://www.atlasevhub.com/materials/state-ev-registration-data/

[xv] Boudway, Ira. "More Than Half of US Car Sales Will Be Electric by 2030." September 20, 2022. Bloomberg. Available at: https://www.bloomberg.com/news/articles/2022-09-20/more-than-half-of-us-car-sales-will-be-electric-by-2030.

[xvi] National average load curves from the U.S. DOE, 2017, National Plug-In Electric Vehicle Infrastructure Analysis, Available at: https://www.nrel.gov/docs/fy17osti/69031.pdf, and the U.S. DOE's Alternative Fuels Data Center's Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite tool, available at: https://afdc.energy.gov/evi-pro-lite.

[xvii] System peaks from 2019 – 2021. Peak load data from U.S. Energy Information Administration, form 930.