Driving Affordable Rates with EVs

Virginia

February 2026 | Sarah Shenstone-Harris, Ida Weiss, Elise Ashley, Deniz Karabakal, Wooddynne Dejeanlouis

Over the past 14 years, electric vehicle drivers in Virginia reduced pressure on electric rates by contributing $102.1 million more in utility revenues than their associated electric system costs.

Evaluating the impact of electric vehicles (EVs) on the road today can help us understand their effect on the grid and how they might shape the power system in the future. This analysis examines utility costs versus revenues from EVs between 2011 and 2024 in Virginia.

When we also include the cost of utility EV programs, EV owners have contributed approximately $91.4[1] million more in revenues than in costs. The widespread benefits EVs provide to utility customers are complemented by other societal benefits. EVs are responsible for far fewer greenhouse gases and local air pollutants than conventional vehicles[a] and become cleaner as more renewable electricity is added to the grid. In addition, EVs are generally much cheaper to operate than conventional vehicles, providing drivers relief from inflationary gasoline prices.[b]

Consumer demand for EVs continues to grow. By the end of 2024, more than 128,000 EVs were on the road in Virginia.[c] This transition has been accelerated by increasingly compelling vehicle offerings, complemented by public actions and supportive policies in recent years.[d] The new electricity load and flexible demand represented by these vehicles have major implications for our future energy system. This analysis demonstrates that electric vehicles have and can continue to put downward pressure on rates, benefiting everyone, especially when they charge during hours of the day when there is less demand on the grid.

Electric Vehicles Can Improve Affordability

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. Determining the effect of EVs on rates requires comparing electric utility revenues from EV charging against utility costs associated with serving EV load. If the utility revenues from EVs exceed the incremental utility system costs, then EV adoption can put downward pressure on 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 for utilities without revenue decoupling. For utilities without revenue decoupling, additional revenue from EVs will eventually be accounted for in subsequent rate cases, helping lower the need to raise rates. 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 rate increases.[2]

Multiple prospective studies have forecasted that utility revenues will exceed costs with future electrification.[e] However, this analysis uses real-world data to evaluate utility system revenues and costs associated with EVs purchased from 2011 to 2024 in Virginia.

Specifically, this analysis tracks revenues and costs associated with over 128,000 battery electric and plug-in hybrid EVs sold between 2011 and 2024 in Virginia.[f]

---

[1] All dollar values are in 2025 real dollars.

[2] Virginia does not currently have revenue decoupling for electric rates.

For each year, Synapse analyzed the electricity rates that EV owners pay compared to the marginal cost of providing that electricity (generation, transmission, and distribution costs) plus the expenditures associated with utility EV programs. We gathered cost and rate data from across the country to inform this analysis, including from RTOs, the Federal Energy Regulatory Commission, filed tariffs, and published marginal cost values. While managed charging and time-of-use ("TOU") tariffs are becoming more common 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 (DOE)'s Alternatives Fuels Data Center.[g] We also use a database of EV program expenditures,[h] assuming that these investments will be paid off over 10 years.

Impact of EV Charging on Electricity Rates in Virginia

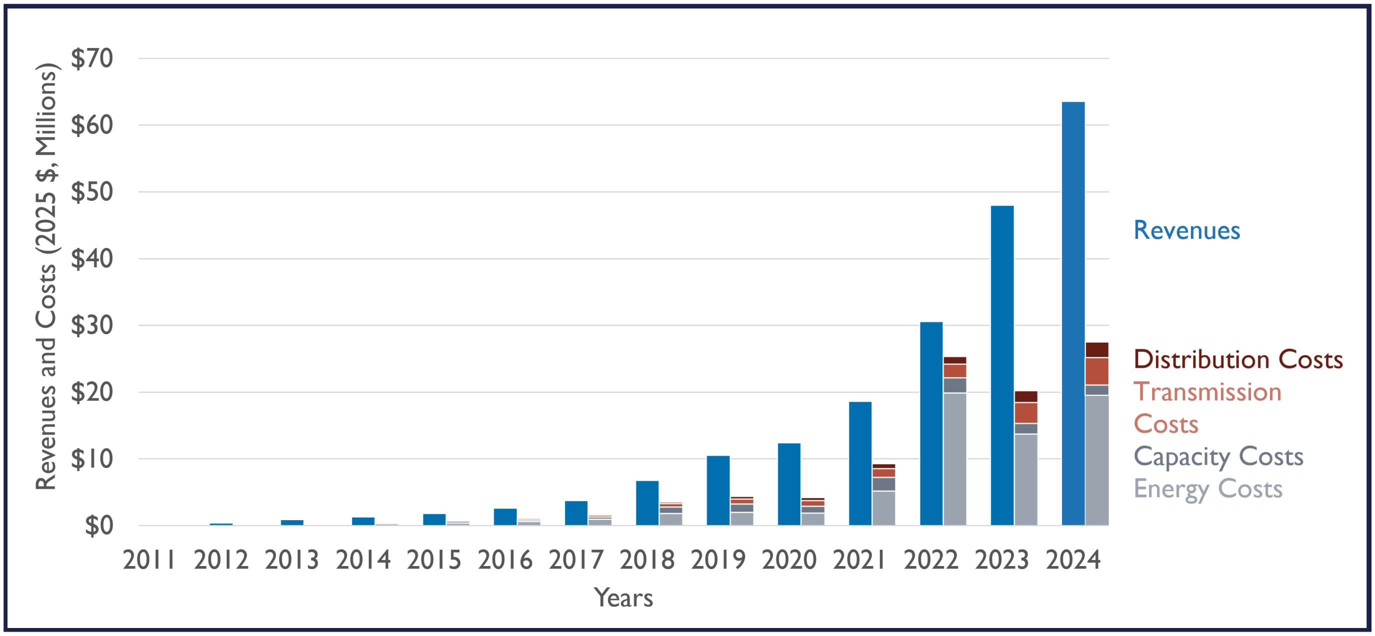
By comparing the revenues generated by EV charging to the utility's marginal cost to serve these EVs, we can construct a picture of whether EVs are creating more revenues than costs (driving down rates for everyone) or creating more costs than revenues (driving up rates for everyone).

The results of our analysis indicate that in Virginia,

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 Virginia have contributed $102.1 million more in revenues than associated costs, cumulatively between 2011 and 2024, even assuming significant levels of on-peak charging. Figure 1 shows the extent to which revenues from EVs outweigh the generation (energy and capacity), transmission, and distribution costs for the period 2011-2024.

Figure 1. Total costs versus total revenues of EV charging in Virginia, per year from 2011-2024.



As electric vehicle adoption accelerates across the country, utilities are implementing programs to expand charging infrastructure and help accelerate electrification. Our analysis shows that in Virginia, revenues created by EV charging support both the costs to serve EVs as well as EV programs themselves. When utility spending on EV programs are included in the analysis, EVs contributed $91.4 million more in revenues than costs.

Tracking EV Adoption Across Virginia

In 2011, which was the first year of our analysis, roughly 300 EVs were on the road in Virginia. By 2024, the number of EVs surpassed 128,000[i] –more than a 400-fold increase from 2011.[j] As can be seen in Figure 2, EV adoption rates have accelerated rapidly in recent years; this trend is also evident in the revenues and costs, which closely track EV adoption.

Figure 2. Cumulative EV on the road in Virginia, 2011-2024

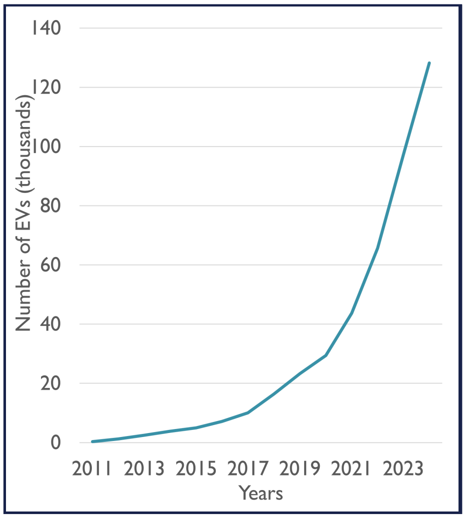
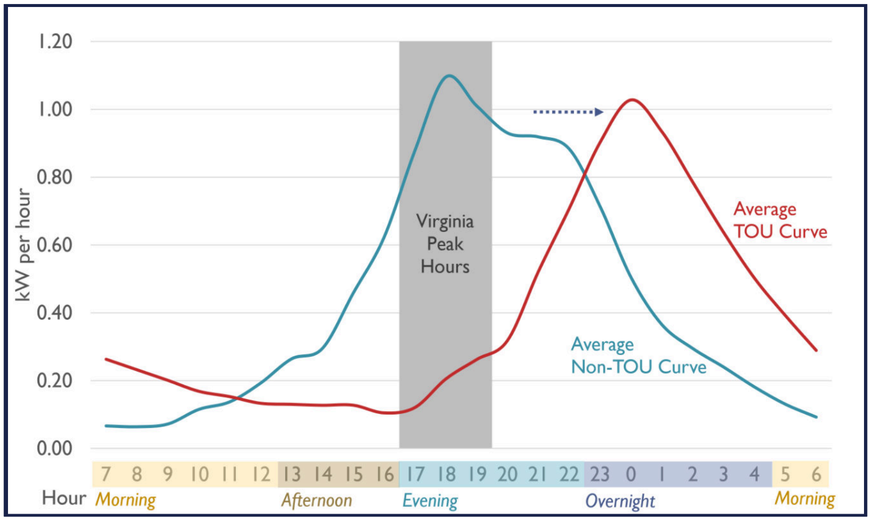


Figure 3. Typical non-TOU EV charging curve versus the California TOU average EV charging curve, with Virginia peak hours



Note: Figure 2 includes new EV sales and vehicle replacement of older vehicles.

EV Charging Patterns and Time-of-Use Charging

The time of day that EV charging occurs is a significant determinant of grid impacts and costs. If vehicles charge when demand is already high and electricity is the most expensive, EV load could exacerbate grid conditions, leading to more expensive generation coming online and potentially additional infrastructure investments. If EVs 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.

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. This hourly use pattern was developed by the DOE's Alternatives Fuels Data Center,[k] representing charging patterns of EVs not taking service on time-of-use rates (which is consistent with the vast majority of EVs on the road in Virginia).

Time-of-use (TOU) rates affect the costs that customers pay depending on when they use electricity and can incentivize consumers to use electricity when it is least expensive for everyone (e.g., 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 TOU rates. Figure 3, 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 Virginia when the electric system peaks[l] and when electricity tends to be most expensive.

As Figure 3 shows, the price signals provided by the TOU rates shifts typical EV charging from times of peak use to overnight periods, when demand is typically low. This shift reduces costs to EV owners and operators for charging their vehicles, while also more efficiently using electricity infrastructure and reducing costs for everyone.

In 2016, Dominion Energy introduced a voluntary TOU rate for residential EV customers in Virginia, and more recently offered a variety of optional TOU rates for all residential customers.[m] In 2025, Virginia's second largest investor-owned utility, Appalachian Power, also introduced TOU rates for residential EVs.[n] TOU rates, especially rates designed specifically for EVs, are beneficial for both utilities and customers. Since these rates encourage customers to charge primarily during off-peak hours, they help reduce the need for costly grid upgrades while also increasing utility revenues, thereby helping to improve electric rate affordability. These types of rates will become especially important as the number of EVs on the roads increase in the coming years. Even so, our analysis shows that although most EV drivers in Virginia are not yet using TOU rates, EVs are still improving affordability, rather than worsening it.

EVs Can Continue to Put Downward Pressure on Rates and Improve Affordability

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 maximize benefits for 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 Virginia has already resulted in more electricity revenues than costs, and future growth in the EV market will lead to further increases in utility revenues. Further implementation of 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-driving-affordable-rates.

Endnotes

[a] Rocky Mountain Institute (2022). More EVs, Fewer Emissions. Available at: https://rmi.org/insight/more-evs-fewer-emissions.
[b] 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
[c] Alliance for Automotive Innovation (2025). Advanced Technology Vehicle Sales Dashboard. Data retrieved December 2025. Available at https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard.
[d] For example, in 2021, Virginia adopted the Clean Cars Standard with annual zero-emissions vehicle sales targets, and Fairfax County, VA has an EV readiness strategy with a local target of increasing market share of EVs by 15 percent by 2030. Available at: https://electrificationcoalition.org/virginia-joins-agreement-to-electrify-trucks-and-buses/ and https://www.fairfaxcounty.gov/environment-energy-coordination/sites/environment-energy-coordination/files/Assets/2025/2025%20Fairfax%20County%20EV%20Readiness%20Strategy_A-1a.pdf
[e] 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 Pursuant 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
[f] Alliance for Automotive Innovation (2025). Advanced Technology Vehicle Sales Dashboard. Data retrieved December 2025. Available at https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard.
[g] Department of Energy, Alternative Fuels Data Center. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Data retrieved December 2025. Available at: https://afdc.energy.gov/evi-pro-lite.
[h] Data on utility expenditures on EV programs was provided to Synapse from Atlas Public Policy (EV Hub) in December 2025. EV programs related exclusively to medium-and-heavy duty vehicles were excluded from the analysis.
[i] Alliance for Automotive Innovation (2025). Advanced Technology Vehicle Sales Dashboard. Data retrieved December 2025. Available at https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard.
[j] Assumed survival rates from the EPA's mid-term evaluation of the Light Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards. Oak Ridge National Laboratory, January 2022. Transportation Energy Data Book, Edition 40, Table 3.15. Available at: https://tedb.ornl.gov/data/
[k] Department of Energy, Alternative Fuels Data Center. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Data retrieved December 2025. Available at: https://afdc.energy.gov/evi-pro-lite
[l] System peaks from 2019 – 2024. Peak load data from U.S. Energy Information Administration, form 930.
[m] Dominion Energy, Rate Schedules. Available at: https://www.dominionenergy.com/virginia/rates-and-tariffs/residential-rates
[n] Appalachian Power, Virginia, Electric Rates. Available at: https://www.appalachianpower.com/company/about/rates/va/