How Will Future Electric Vehicle Adoption and Building Electrification Affect Electric Rates?

February 2025 | Sarah Shenstone-Harris, Sophie Schadler, Ariella Fuzaylov, Ida Weiss, Kenji Takahashi, Melissa Whited

STATE: NEW JERSEY

Future vehicle and building electrification in New Jersey can put downward pressure on electric rates, benefiting electric customers

- **Transportation and building electrification will generate roughly $1.55 billion more in utility revenues than costs over the next 11 years, putting downward pressure on electric rates to the benefit of all utility customers.**
- **Electrification allows fixed electric utility system costs to be spread out over a higher volume of sales, and as electric utilities see more EVs and heat pumps added to their service territories, their annual sales of kilowatt-hours increase accordingly, reducing the price per kilowatt-hour.**
- **Cumulatively, light-duty vehicles are expected to yield $362 million more in revenues than costs over 11 years.**
- **For residential buildings, the cumulative 11-year revenues are $625 million more than their associated costs.**
- **New Jersey customers that electrify will likely see savings on their total energy spending (while they will spend more on electricity, they will typically spend less on gasoline and heating fuel). Even customers who do not electrify will see lower electric bills than they otherwise would have as a result of electrification putting downward pressure on rates.**

Electric vehicles (EVs) and heat pump adoption are increasing rapidly across the country due to numerous municipal, state, and federal policies, as well as changing consumer preferences.[i,ii] Not only do EVs and heat pumps emit less carbon and fewer air pollutants, but they are also much more efficient than their fossil fuel alternatives and therefore can reduce total energy costs for households and businesses.

Synapse assessed the impact of EVs and building electrification on residential and commercial electric rates from 2025 through 2035 in New Jersey.[1] Despite the additional electricity system costs associated with electrification, we find that in the next 11 years, transportation and building electrification will generate roughly $1.55 billion[2] more in utility revenues than costs (Figure 1), benefiting both electric utilities and their customers.[3]

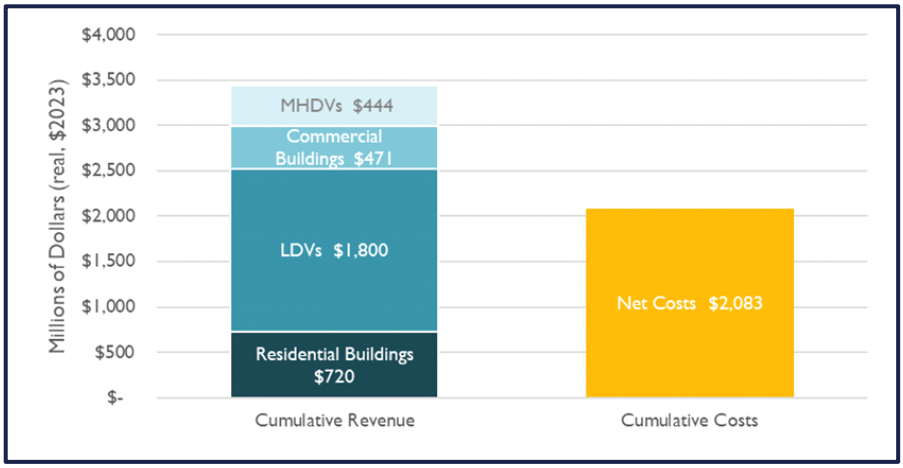

Figure 1. Cumulative revenues and net costs from building electrification and EVs, 2025-2035

[1] Due to the wide variation in industrial customer types and associated industrial electrification, we excluded the industrial class from this analysis.

[2] The total cumulative net revenue for New Jersey due to new electrification is roughly 1.4% of cumulative total residential and commercial revenue requirements. As a result, residential and commercial rates remain essentially unchanged.

[3] Relative to a scenario without electrification. Presented in real-dollar terms, controlling for inflation.

How Might Electrification Affect Electric Rates in New Jersey?

As more households and businesses purchase EVs and transition to electric heat pumps, electricity system costs will increase to serve that new load. Specifically, more energy will be generated to provide electricity to EV chargers and heat pumps, and more generating capacity, such as renewable energy facilities, will be built to meet that new load.[4] Transmission lines may need to be upgraded or constructed to move electricity from the point of generation to where more electricity is needed.[5] The distribution grid may also need upgrades or expansions to continue reliably serving growing demand, which may require additional investments for higher capacity power lines, transformers, and substations.[6]

Although system costs increase with electrification, so do electric utility revenues. As the electric utility sees more EVs and heat pumps added to its service territory, its annual sales increase accordingly (Figure 2). As sales grow, the electric utility can collect more money from its total base of customers.

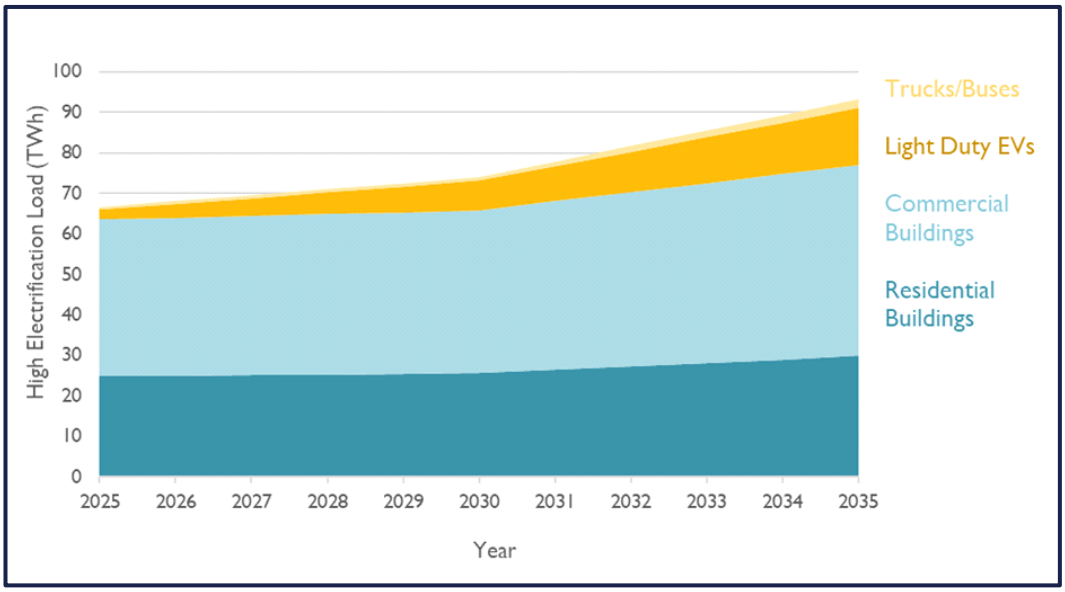

Figure 2. Future electricity consumption, from 2025 to 2035, in New Jersey

Notes: Load forecasts are sourced from LBNL's Cambium 2023's high electrification scenario,[iii] and the sector breakdown is sourced from LBNL's Electrification Futures Study.[iv]

If the utility system costs associated with electrification are greater than the associated revenues, electric customers could end up paying more for their electricity—even those who do not own EVs or who have not electrified their homes or businesses. Conversely, if the utility revenues exceed the system costs, then electrification will exert downward pressure on electricity rates, benefiting electric customers. Previous Synapse studies[v] have found that historical EV adoption has put downward pressure on electricity rates for both EV owners and non-owners alike. Electrification allows

[4] We applied marginal energy and capacity costs to load forecasts, both sourced from National Renewable Energy Laboratory's (NREL) Cambium 2023 data sets ("high demand growth" and "reference demand growth" scenarios). The difference in energy and capacity costs between the "high demand growth" and "reference demand growth" represent incremental costs.

[5] We applied avoided transmission costs used for demand response and energy efficiency cost-effectiveness tests in a cross-section of states, to the Cambium 2023 "high demand growth" and "reference demand growth" load forecasts. The difference in transmission costs between the "high demand growth" and "reference demand growth" represent incremental costs.

[6] We applied avoided distribution costs used for demand response and energy efficiency cost-effectiveness tests in a cross-section of states to the Cambium 2023 "high demand growth" and "reference demand growth" load forecasts. The difference in distribution costs between the "high demand growth" and "reference demand growth" represents incremental costs. The true distribution system upgrade costs are highly location-dependent and depend on the capacity of each piece of shared equipment, the existing load using that equipment, and the specific qualities of new load.

fixed electric utility system costs to be spread out over a higher volume of sales.

Generally speaking, utility revenues associated with new electrification load are higher than the utility costs the new load is imposing. A utility's revenues are driven by its retail rates, which are typically based on embedded historical costs or the average costs for the utility to serve its customers. On the other side of the ledger, the utility costs are driven by marginal costs, which is the incremental cost of one additional unit of energy delivered. Average costs (used to set rates and drive revenues) are usually higher than marginal costs (which drive total actual cost to serve new load), meaning that revenues associated with new electrification are typically higher than the associated costs.

Light-Duty Vehicle Electrification

In each year of our study period, the estimated utility revenues from future light-duty EV adoption exceed the associated incremental electricity system costs, putting downward pressure on rates. Cumulatively, light-duty vehicles yielded $362 million in net revenue over 11 years.

Distribution costs, transmission costs, and capacity costs are all driven by increases in demand. In New Jersey, these demand-driven costs represent 64 to 80 percent of total incremental costs associated with light-duty vehicles. Energy costs are also most expensive during peak periods when unmanaged EVs typically charge. Luckily, light-duty vehicles are a flexible resource; EV charging can be shifted away from peak periods in most cases. In fact, encouraging managed charging, such as time-of-use (TOU) rates, can reduce demand during system peak load from light-duty EVs anywhere from 30[vi] to 70[vii] percent. Although not modeled here, implementing TOU or other managed charging programs can reduce demand during peak periods and encourage off-peak energy usage, decreasing the total grid costs associated with EVs and further increasing net revenue and downward pressure on rates.

Residential Building Electrification

For residential buildings, the revenues from electrification exceed total incremental electricity system costs in later years of our study, yielding a net revenue of $625 million. Importantly, the cumulative 11-year revenues are greater than their associated costs by almost seven-fold. This means that the electrification of residential buildings in New Jersey is predicted to exert downward pressure on electric rates, especially in the medium and long terms. Although home energy demand is less flexible compared to EVs, there are many electric appliances such as water heaters, dishwashers, and dryers that can be shifted to off-peak periods to reduce demand-related costs associated with building electrification.

In the short term in New Jersey, the conversion of older air conditioning units and electric resistance heaters to more efficient heat pumps acts as an energy efficiency measure, reducing total energy consumption and peak demand from residential buildings. This means that residential customers switching from older electric appliances to more efficient heat pumps will see savings on their electric bills. While utilities' revenues decrease in the short term because of fewer electricity sales, their costs also decrease from reductions to peak demand and total energy consumption. Specifically, as peak demand decreases, there is more available capacity on the distribution and bulk power system grid to accommodate more electrification, such as from EVs. By the beginning of the next decade, heat pump adoption will accelerate, and utility revenues associated with residential buildings will grow faster than the costs to serve that new electric load. Overall, building electrification will put downward pressure on rates in New Jersey.[7]

Commercial Building and Transportation Electrification

The impact on electric utility rates from commercial electrification is slightly more modest compared to residential electrification. Nonetheless, there is an 11-year cumulative net positive revenue of roughly $560 million associated with commercial building and vehicle electrification. Medium- and heavy-duty vehicles are generally considered less flexible compared to light-duty vehicles, as fleet owners often have operational constraints that must be met (e.g., scheduled cargo deliveries). However, on average, many medium- and heavy-duty vehicles, such as buses and large tractor-trailers, tend to charge during off-peak periods; this keeps incremental distribution costs lower compared to their light-duty counterparts[viii] and improves their beneficial impact on electric rates by using spare capacity on the grid.

[7] Demand flexibility was not considered in this analysis.

How Do Electric Customers Benefit from Electrification?

When revenues from new electrification load exceed the costs incurred to serve that load, as we predict will happen in New Jersey (Figure 3), electric rates may be reduced relative to what they would have been without electrification.

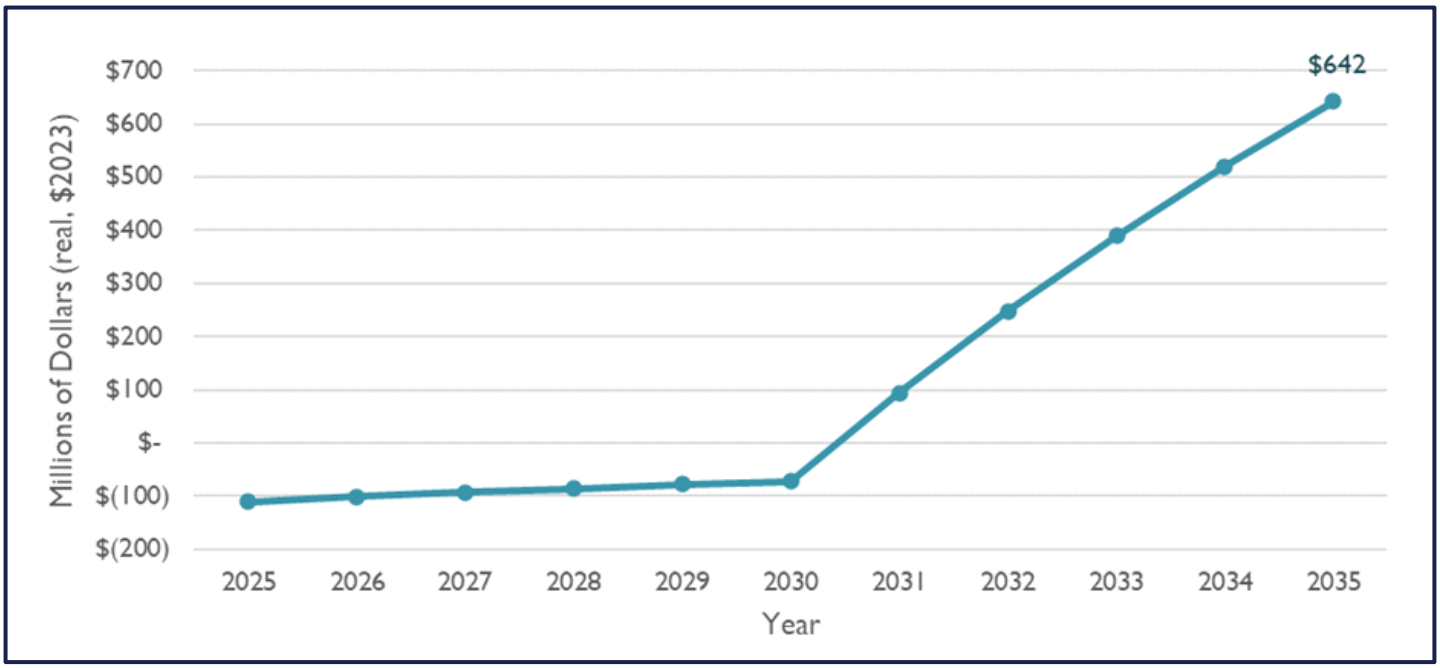

Figure 3. Total net revenue

For regulated utilities, rates are designed to recover the utility's costs to provide reliable service, plus an allowed rate of return. Rates are typically set based on a set quantity of electricity sales (as determined in the test year of a rate case). Under this approach, utilities may collect more revenue between rate cases if electricity sales grow (from electrification or other factors), or they may under-collect revenue if electricity sales are lower than expected.[8] The additional revenue from greater electricity sales could be used to offset additional utility costs that would otherwise require the utility to file a rate case sooner, resulting in a benefit to customers. Once a rate case is filed and the higher load from electrification is used to set new electric rates, customers realize the benefits from spreading the utility's fixed costs over greater sales.

We estimate that residential and commercial electric rates will remain relatively flat as a result of electrification through 2035. This means that the many benefits of electrification, such as reduced air pollution and greenhouse gas emissions, can be realized without any negative economic impact to electric customers, including customers without EVs or heat pumps. Customers that do electrify will likely see savings on their total energy spending, as EVs and heat pump space and water heaters are substantially more efficient than their fossil fuel alternatives. Electrification of New Jersey's buildings and transportation system serves as a win-win for electric utilities and their customers.

[8] While many utilities in New Jersey have partial revenue decoupling for energy efficiency programs, they do not currently have full revenue decoupling. Advanced Energy United Insight Engine, State Profile: New Jersey.

Endnotes

[i] International Energy Agency, December 2022. The Future of Heat Pumps. https://iea.blob.core.windows.net/assets/4713780d-c0ae-4686-8c9b-29e782452695/TheFutureofHeatPumps.pdf.

[ii] BloombergNEF, 2024. Electric Vehicle Outlook 2024. https://about.bnef.com/electric-vehicle-outlook/#download.

[iii] Gagnon, P., Cowiestoll, B., Schwarz, M. 2023. Cambium 2023 Scenario Descriptions and Documentation. National Renewable Energy Laboratory. https://www.nrel.gov/docs/fy23osti/84916.pdf.

[iv] Cambium 2023 forecasts are sourced from NREL's Electrification Futures Study, with minor modifications. Mai, T., Jadun, P., Logan, J., McMillan, C., Muratori, M., Steinberg, D., Vimmerstedt, L., Jones, R., Haley, B., and Nelson, B. 2018. Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States. National Renewable Energy Laboratory. NREL/TP-6A20-71500. https://doi.org/10.2172/1459351.

[v] Shenstone-Harris, S., Rhodes, P., Frost, J., Carlson, E., Borden, E., Lane, C., Whited, W. January 2024. Electric Vehicles are Driving Rates Down for Customers: National Update. Prepared for Natural Resources Defense Council by Synapse Energy Economics. https://www.synapse-energy.com/evs-are-driving-rates-down.

[vi] National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, Kevala Inc., and U.S. Department of Energy. 2024. Multi-State Transportation Electrification Impact Study: Preparing the Grid for Light-, Medium-, and Heavy-Duty Electric Vehicles. DOE/EE-2818, U.S. Department of Energy. https://www.energy.gov/sites/default/files/2024-03/2024.03.18%20NREL%20LBNL%20Kevala%20DOE%20Multi-State%20Transportation%20Electrification%20Impact%20Study%20FINAL%20DOCKET.pdf.

[vii] Schuler, M. March 2024. 2024 Electric Vehicle Forecast Update. New York Independent System Operator (ISO). https://www.nyiso.com/documents/20142/43675604/04_20240321_ESPWG_EV_Forecast_V1.pdf/36b1e462-99c9-14f8-ebb1-d9a8680b4936.

[viii] Based on medium- and heavy-duty vehicle load curves from Lawrence Berkeley National Laboratory, HEVI-Pro load profiles. Provided to Synapse Energy Economics in August 2022.