THE MARKET CAN DRIVE ELECTRIC VEHICLE SALES

by James E. Hanley

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New York has adopted a statutory goal that 100 percent of new passenger car and truck sales be zero-emissions vehicles (ZEVs) by 2035. Ultimately, the only way to accomplish this goal will be to prohibit sales of new internal combustion engine (ICE) vehicles, whether gasoline, diesel, or even plug-in electric hybrid. The state has also set intermediate goals for ZEV sales that it is unlikely to meet because of how rapidly they would require sales of electric vehicles to grow and because many consumers are likely to buy new cars out of state or move into the used ICE vehicle market.

The ZEV mandate will harm moderate- to low-income auto owners by driving price increases in the used ICE market, and will hit most heavily in upstate New York, where lower percentages of people own electric vehicles. In addition, an increase in out-of-state new vehicle purchases and a "gray market" in the importation of lightly used vehicles are likely to undermine the state's ZEV sales goals.

Critically, the mandate is not necessary in the long run. New York's light-vehicle transportation sector has a minuscule effect on global climate. Also, consumers are increasingly choosing electric vehicles without government mandates, and under reasonable assumptions will – just through market choices – achieve the state's 2050 Climate Leadership and Community Protection Act goals for greenhouse gas emissions reductions, at least for the light-duty vehicle transportation sector's share, by 2051.

INTRODUCTION

In September 2022, Governor Kathy Hochul signed legislation making it "a goal of the state" that by 2035 all new passenger cars and trucks sold or leased in the state be zero-emission vehicles.[i] The purpose is to reduce greenhouse gas (GHG) emissions in the transportation sector, which accounts for 28 percent of the state's GHG emissions.[ii]

While the statute does not explicitly require a ban on internal combustion engine vehicles, it does require the Department of Environmental Conservation to establish regulations that progressively move the state toward the target of no new ICE sales. This means that – barring implausibly rapid changes in consumer behavior – sales of new light-duty ICE vehicles ultimately must be banned.

Normally a state could not take such an action, as the federal government has preempted the regulatory control of motor vehicle emissions standards. However, California has long had a statutory exception allowing it to request waivers from the United States Environmental Protection Agency in order to set clean air standards that are stricter than federal standards. When California is granted a waiver, other states are then allowed to adopt its standard.[iii] California has long had a waiver on clean air standards for vehicles, so when the state announced in September 2022 that it was moving to ban sales of new light-duty ICE vehicles, the way was cleared for New York's law to take effect.[iv]

In addition to the 2035 target, New York has also set interim goals of having 850,000 ZEVs on the road by 2025 – up from around 87,000 in 2022 – and that ZEVs comprise 35 percent of new car sales in 2026 and 68 percent in 2030,[v] up from about 2.5 percent in recent years.[vi]

Importantly, the ban on internal combustion engine vehicle sales applies only to new vehicles. This means that for the foreseeable future there is likely to remain a robust secondary market for internal combustion engine vehicles. This may include a market for lightly-used vehicles imported from out of state, as well as an increase in New Yorkers purchasing new ICE vehicles in neighboring states, reducing the effectiveness of the ZEV policy.

By driving more people into the used car market, the prices of used cars may increase, harming moderate- to low-income auto owners who depend on the used market for their vehicle purchases. Also, because upstate ZEV ownership is currently significantly lower than downstate ZEV ownership, the effect of the mandate will hit harder in upstate regions, where consumers are less ready to transition to ZEVs.

Ultimately the mandate is unnecessary. Rising consumer demand is driving growing market share for zero-emission vehicles. As shown below, using more reasonable assumptions than the state's goals require, ZEVs could have 85 percent of new vehicle market share by 2051 through voluntary adoption. The state' Climate Leadership and Community Protection Act calls for an 85 percent reduction in greenhouse gas emissions by 2050, so market forces are likely to effectively meet the light-duty vehicle's portion of that goal.

THE IMPLAUSIBILITY OF NEW YORK'S ZEV GOALS

There will be roughly 87,000 battery-electric vehicles (BEVs) in New York by the end of 2022.[vii] Growth has accelerated from increases of approximately 5,000 per year between 2017-18 to around 20,000 per year between 2020 and 2022.

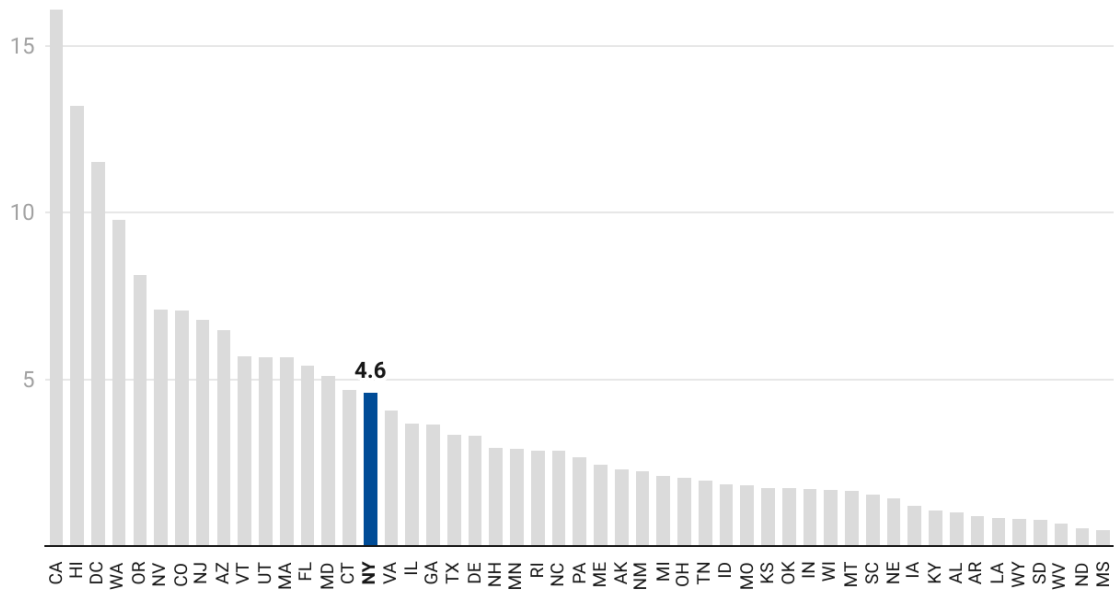
But New York still lags behind other states in electric vehicles as a share of total light-duty vehicles. In 2021, the state ranked only 17th among the 50 states and D.C. in BEVs per thousand vehicles (figure 1, page 4).[viii] If we consider both BEVs and Plug-in Electric Hybrids (PHEVs, which will also be banned under the ZEV mandate, as they have internal combustion engines), the state does only slightly better, coming in at 13th (figure 2, page 4).[ix]

Nor are New Yorkers rushing to catch up with the states ahead of them. In the first half of 2022, only 3.7 percent of new car sales in New York were electric (unspecified as to BEV or PHEV) compared to 6.7 percent nationally.[x]

Hoping to increase the percentage of electric vehicles in the state before the 2035 ZEV mandate, New York has set multiple intermediate goals. Among these are a target of 850,000 ZEVs by 2025,[xi] 35 percent of new light-duty vehicles sales being ZEVs in 2026 and 68 percent of such sales being ZEVs in 2030.[xii]

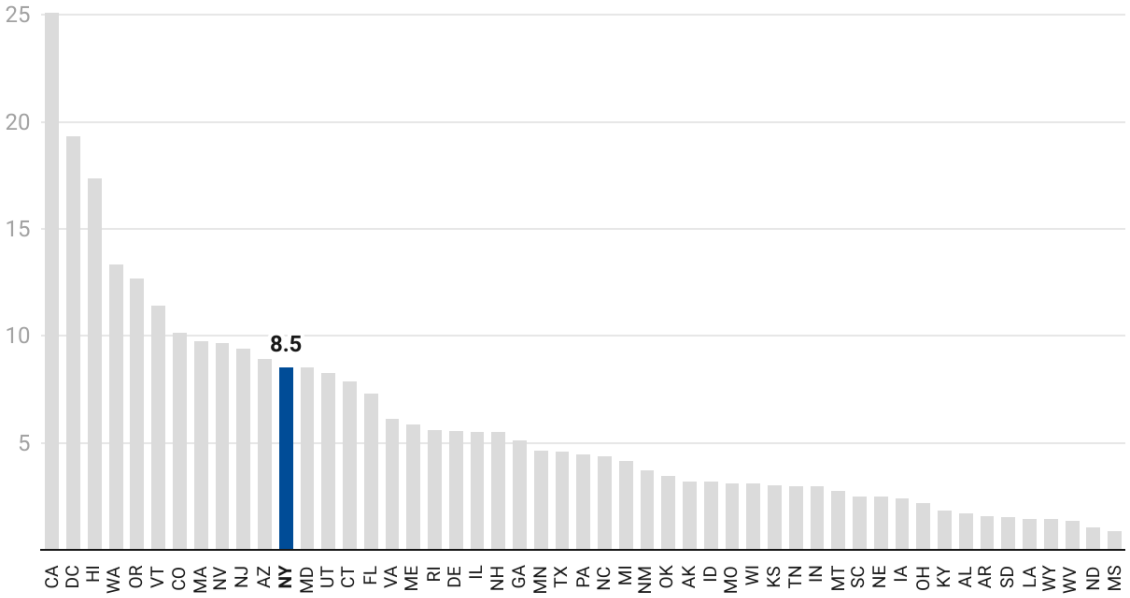
These vehicles will almost certainly be nearly all BEVs. Plug-in hybrids incorporate an internal combustion engine, so they will presumably be prohibited. And while hydrogen fuel cell vehicles are also emissions-free, there are currently less than 100 in the state.[xiii] The restriction to ZEVs, then, is essentially a restriction to BEVs.

Figure 1: BEVs per 1,000 Light-Duty Vehicles



Source: Alternative Fuels Data Center • Created with Datawrapper

Figure 2: BEVs+PHEVs per 1,000 light duty vehicles



Source: Alternative Fuels Data Center • Created with Datawrapper

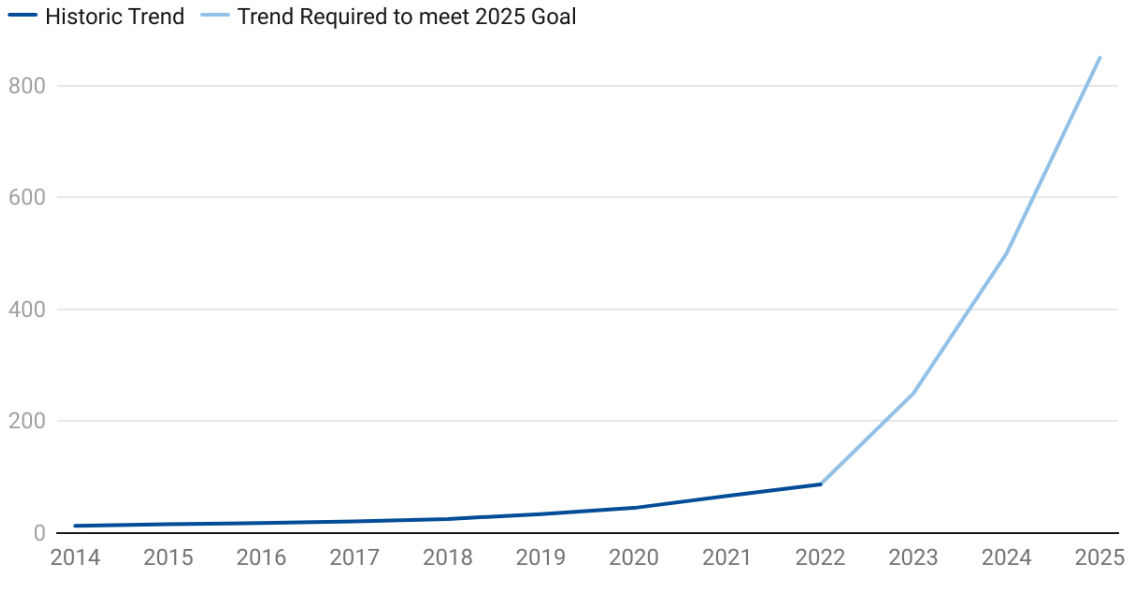
The goal of 850,000 by 2025 requires an 877 percent increase in only three years. Achieving this would require a dramatic – and highly improbable – uptick in EV sales over the next three years, as shown by the sharp upward bend in the projected trend-line in figure 3.

The goal is so improbable that even if the state met its 2026 goal of 35 percent of new car sales being ZEVs by 2023 – three years early and ten or more times the current share – and sustained that through 2025, it would come to about 840,000 ZEVs sold. So even heroic assumptions that sales goals are met several years ahead of schedule fall just short of achieving this goal for total ZEVs in the state.

The other intermediate goals of 35 percent of new car sales by 2026 and 68 percent by 2030 are equally implausible. With approximately 9.5 million light duty vehicles registered in New York state,[xiv] and the average light car or truck in the United States being kept about 12 years,[xv] New Yorkers probably buy around 790,000 new cars each year. Based on that assumption and using DMV numbers for BEVs registered in the state, figure 4 (page six) shows how immediately and sharply upward the sales trend must bend to meet the state's 2026 and 2030 sales goals.

Not only must New York radically increase its share of BEV sales to meet the state's near-term goals, it must do so in a market that may not be able to meet national demand for such vehicles. California – the country's largest car market – has also implemented a ZEV mandate and BEV demand is growing across the country. Some automakers warn that supply chains may be unable to keep up with growing demand.[xvi] This will make it challenging

Figure 3: Increase in Trend Required to Meet NY's 2025 Goal of 850,000 ZEVs



Source: New York Department of Motor Vehicles • Created with Datawrapper

for New York to meet these goals even if consumer demand does – improbably – skyrocket.

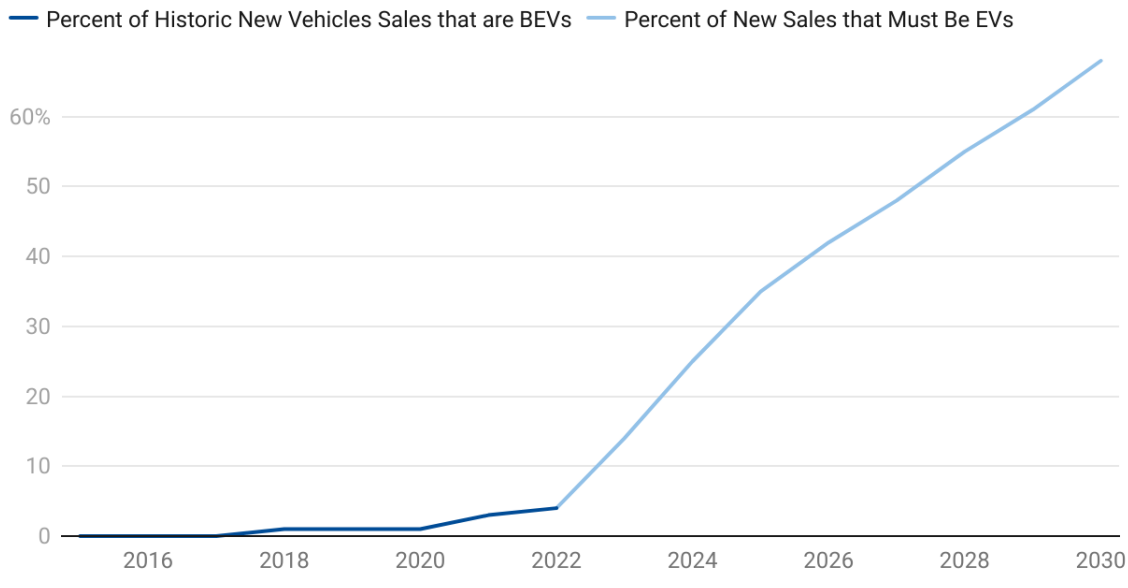
Another factor that may negatively affect EV sales in the medium term is the effect of the Inflation Reduction Act, which places strict limits on which EVs can receive subsidies. While the Act extended the EV subsidy through 2032, in an attempt to spur development of a non-Chinese controlled supply chain, it authorizes subsidies only for EVs that have a required minimum of materials mined or processed in the U.S. or countries with which the U.S. has a free trade agreement.[xvii] The minimum proportion, by value, begins at 40 percent in 2024 and increases to 80 percent in 2027.

Because of Chinese domination of the processing of raw materials for batteries,[xviii] political opposition to mining both in the U.S.,[xix] and abroad[xx] and the regulatory challenges of siting critical materials mines in the U.S.,[xxi] the most immediate effect of the Inflation Reduction Act may be to remove subsidies from many electric vehicles beginning in 2024, raising their effective prices and deterring some part of the auto-buying public.

In summary, the state has set short-term goals for ZEV sales growth that are beyond ambitious and therefore doomed to fail. This means that New Yorkers are unlikely to be ready to transition to having no new car options but ZEVs by the 2035 deadline.

Because New Yorkers will not yet be ready for a full transition to ZEVs, the letter of the mandate may be met while the spirit of the law is broken. That is, any new car sold in New York after 2035 may indeed be a ZEV – mostly BEVs – but because New York cannot prohibit residents from importing cars, those who live within reasonable distance of

Figure 4: Percent of New Vehicle Sales That Must be BEV to Meet NY's 2026 and 2030 Goals



Source: New York Department of Motor Vehicles • Created with Datawrapper

a neighboring state may prefer the option of crossing state lines to buy a new ICE vehicle.

In addition, a "gray market" in very lightly used imported ICE vehicles may develop. Vehicles bought new then driven for a few hundred miles could be imported and resold to New York consumers willing to pay a price premium to get what is in substance if not in technical fact a brand-new ICE car or truck. More generally, New York may become a target market for late model used cars.

The extent to which these unintended consequences play out is impossible to say, but they are bound to occur. And the less ready New Yorkers are for the ZEV mandate, the more they will substitute for the intended behavioral effect of the law, undermining the state's real goal of reducing greenhouse gas emissions in the transportation sector.

THE INTERNAL COMBUSTION ENGINE BAN DISPROPORTIONATELY HARMS POOR AND UPSTATE NEW YORKERS

Some will take the slow adoption of EVs as evidence that mandates are necessary to achieve state goals. But what the evidence of slow adoption really shows is that mandates will harm consumers who are not ready to purchase EVs – particularly moderate- to poor-consumers and upstate auto owners.

Despite public policy efforts to mainstream them, EVs remain a status symbol. Even after years of subsidies, the average EV owner is still a white male with a household income of over $125,000 per year.[xxii] This income relationship is reflected in New York registration data, where the greater the median household income of the county the higher the rate of EV ownership (figure 5, page 8).[xxiii]

Moderate- to low-income auto owners primarily buy in the used vehicle market, where nearly three-quarters of auto sales take place.[xxiv] So, it's important to try to understand the effect the ZEV mandate will have in that market.

As a first pass, it's likely that the ICE ban will drive even more people into the market for used internal combustion engine cars, driving up prices in that market.

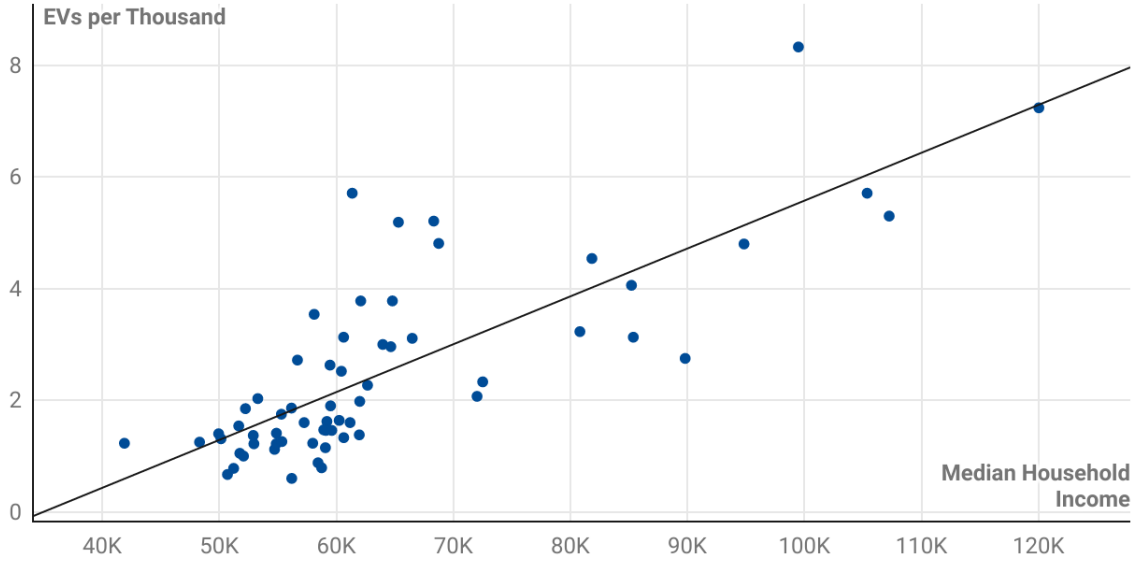
This will happen because people have multiple concerns about BEVs. These are price, range, and the potential difficulty of finding a recharging station.[xxv]

Many predict price parity between ZEVs and ICE vehicles will happen by 2025,[xxvi] as battery prices continue to fall and production costs get spread across a greater number of vehicles. But this may be too optimistic as the decline in battery prices levels off due to high raw materials costs.[xxvii] And if price parity is not reached, some consumers who would have otherwise bought a BEV will find themselves priced out and will shift to the used ICE vehicle market instead.

Range and recharging concerns are often downplayed by BEV advocates who focus only on commuting needs. But while it is true that most people's commutes are short enough to accommodate a BEV, many people want to drive longer distances on occasion. Even if a person is driving beyond the range of a BEV only once or twice a year, if they do not have confidence they can find convenient charging station en route – or are time-constrained and don't want to spend too much time recharging – they will be reluctant to give up on a traditional ICE car.

The more of these cautious consumers who opt for used ICE vehicles, the more upward pressure it puts on prices in that market. And that will most harshly affect the population

Figure 5: EVs per Thousand Residents by Median Household Income of County



that is most heavily dependent on the used car market – moderate- to low-income auto owners.

Ironically, as a response to that upward price pressure, New York may become a target for importation of used ICE cars. It's an open question how the state will then react. Simply banning out of state vehicle importations would likely run afoul of the U.S. Constitution's Interstate Commerce Clause.

One possible policy response would be to tighten the state's emissions-inspection standard – which would mostly affect older, less expensive vehicles. The effect of this policy would of course fall most heavily on the poorest of New York's vehicle owners.

Eventually a used BEV market will develop, but it's currently hard to predict how that will play out. Consumers are likely to be very concerned about the costs of battery replacement. Although batteries reportedly can last up to 200,000 miles (nearly the range of well-maintained internal combustion engines) their ability to hold a charge declines over time, reducing their range.[xxviii]

And while electric vehicles are mechanically more reliable than ICE cars – having only about 20 moving parts in the powertrain as compared to 2,000 for an ICE vehicle[xxix] – the battery itself cannot be cheaply replaced. A 2016 study found the cost averaged $10,000 or more, as much as a reasonably reliable used ICE car.[xxx] This is in line with the cost of replacing an internal combustion engine. But when ICE engines fail, it's typically only parts that need replacing, not the entire engine.

Indeed, if the battery is too far out of date, it may not be replaceable at all.[xxxi] And this may become a common problem, at least tempo-

rarily, as automakers experiment with new kinds of batteries and potentially the industry shifts from lithium-ion batteries to solid-state batteries.[xxxii]

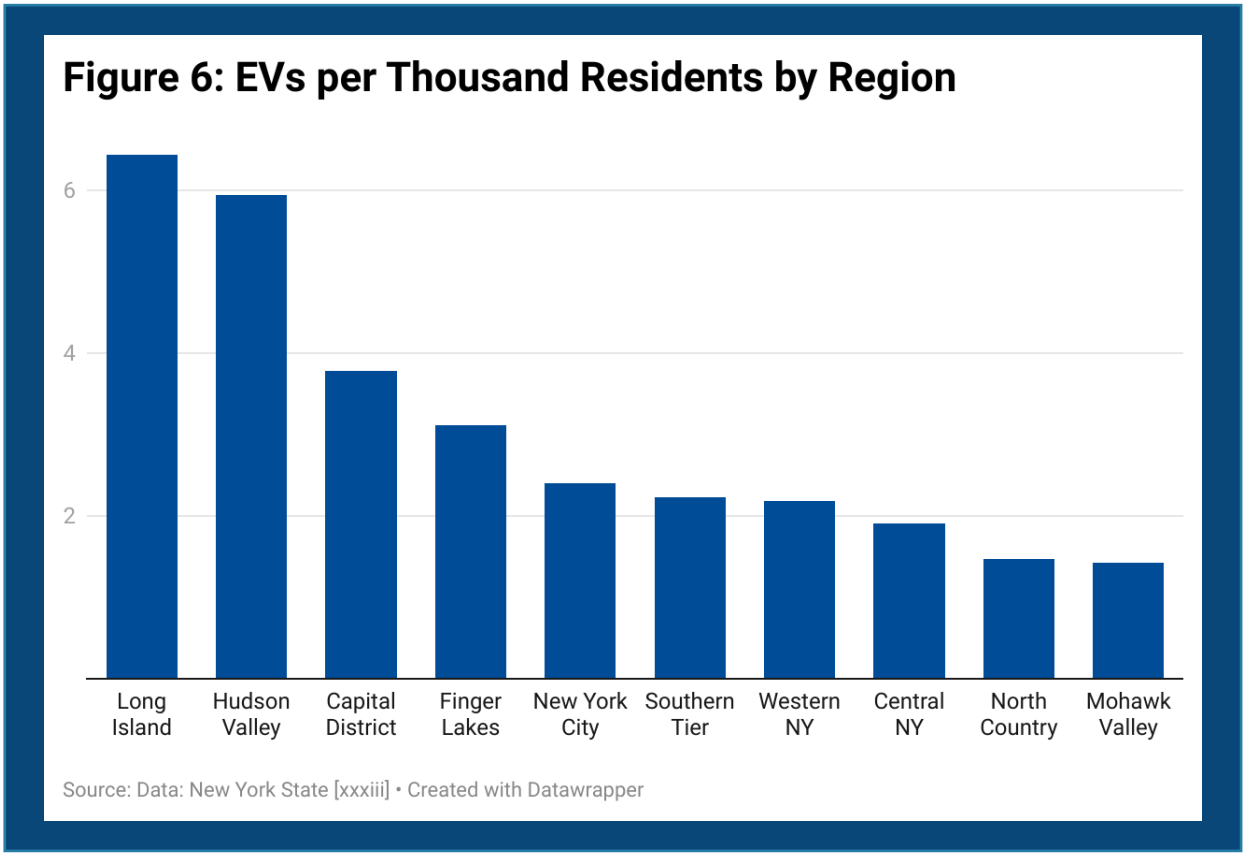
This all means that "inexpensive" used BEVs may turn out to be very costly for those who cannot afford new model ones, at least until the market fully matures, which is not likely to happen until some time after New York's ICE ban takes effect.

The ICE ban also has a regional disparity. Downstate – other than NYC itself, where car ownership in general is lower – has higher rates of electric vehicle ownership (unspecified as to BEVs or PHEVs) than most upstate regions (figure 6). This means the mandate will hit more heavily in upstate regions, where consumers are less prepared to transition to ZEVs.

WHY MANDATES ARE UNNECESSARY IN THE LONG RUN

Some will argue that despite any harm to consumers, mandates are necessary due to the need to combat climate change. However, the mandate will have no measurable effect on the global climate. To the extent BEVs do have a positive environmental effect, just letting the market work should bring New York close to the light-duty vehicles' portion of its 2050 goal of an 85 percent reduction in greenhouse gas emissions.

Transportation accounts for 28 percent of New York's greenhouse gas emissions, with road transport – which includes medium- and heavy-duty trucks as well as light-duty vehicles – accounting for 59 percent of that.



As the Empire State accounts for less than one half of one percent of global greenhouse gas emissions,[xxxiv] New York's total road transport sector is responsible for less than 7/100s of one percent of total global greenhouse gas emissions, with light-duty vehicles accounting for only a portion of that. By itself this minuscule gain would have no measurable effect on global temperatures, and it will be swamped by increases in CO2 emissions from developing countries.

BEV advocates will fairly note that CO2 is not the only emission from vehicles. But most cars already exceed federal emissions standards,[xxxv] and emissions of nitrogen oxide (NOx) in 2025 model vehicles will be 98 percent less than in 1975-era vehicles.[xxxvi] Tremendous gains have been made and should be acknowledged.

But it's not just the minimal climate impact of shifting New York to EVs that makes the mandate unnecessary – it's that the market for EVs is growing, mandate or no, so most of the desired gains will be accomplished without imposing uncompensated costs on moderate- to low-income auto owners, if not by 2035, then by 2050, when the state hopes to achieve an 85 percent reduction in greenhouse gas emissions.

Globally, electric car sales continue to increase, and are now over 14 percent of the market.[xxxvii] In the U.S., sales doubled from 2020 to 2021,[xxxviii] and shot up another 60 percent in the first quarter of 2022, even as total new car sales declined by 18 percent.[xxxix] Even if New York is currently lagging behind, as noted above, sales are increasing here as well.

A survey by the Union of Concerned Scientists shows that more than 1 in 3 Americans are already considering buying a PHEV.[xl] While these will not meet the state's mandates, they show that large portions of Americans are becoming seriously interested in electric vehicles.

The uncertainty about when price parity will be reached was noted above, but even if most predictions are too optimistic, this will presumably occur sometime in the 2030s, if for no other reason than that the price of ICE vehicles will increase as fewer are produced and the costs of development and production are spread across fewer vehicles.

At any rate, as BEVs move towards price parity, the number of people willing to pay the ever-decreasing price premium for them will increase.

However, recent research shows that the primary driver of increasing sales is not simply declining prices but increasing intrinsic demand, as more people become concerned about global warming and more comfortable with EV technology.[xli] This means growth will continue – although more slowly – even if prices do not fall as quickly as BEV advocates hope.

Range concerns should also continue to decrease as battery technology matures and vehicles can travel further on one charge. Improvements in fast-charging help with this concern, as people can expect less downtime on longer trips.

Finally, the more people who buy EVs, the more demand there will be for charging stations, which will lead to more buildout. Government policies will aid in this, but the primary driver – just as with gas stations in an earlier era – will likely be the market. This buildout will then further drive EV purchases in a positive feedback loop.

Overall, the market looks strong enough that most manufacturers are looking to transition to between 50 to 100 percent EV production by 2030.[xlii]

In New York itself, EV sales have increased an average of 33 percent per year over the past

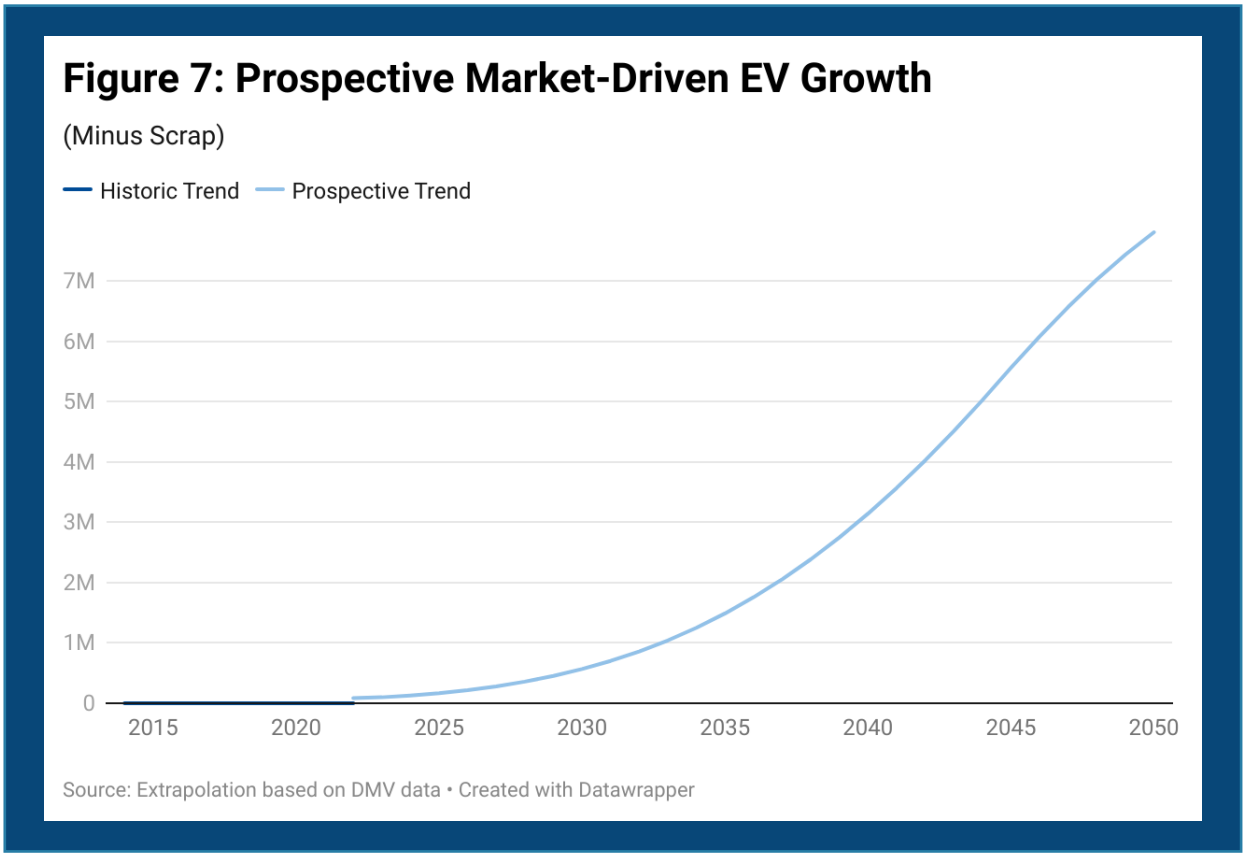
five years.[xliii] While that's not enough to meet the state's unrealistic short-term goals, it sets the state on a positive path for considerable growth by 2050, even if the rate of growth inevitably declines due to saturation of the market.

Assuming the growth rate continues at 30 percent for the next five years (through 2027), then falls by 5 percent per year through 2045 and 10 percent per year through 2050, and accounting for cars that are scrapped across the years, there will be roughly 7.8 million electric vehicles in the state by 2050 (figure 7), about 82 percent of the total number of light-duty vehicles in the state. By 2051, the state would reach 85 percent.

2050 is the year the Climate Leadership and Community Protection Act calls for reaching an economy-wide 85 percent reduction in greenhouse gases. An 82 percent market share of electric vehicles would come very close to achieving the light-duty vehicles' share of that goal, and 85 percent in 2051 would achieve that goal just one year late. And it would do so without forcing people into a market they are not yet prepared to enter.

Notice that unlike figures 2 and 3, in figure 7 there is no unnatural sharp upward bend in the trendline, but a more natural gradual increase. And this growth does not unrealistically require increasing growth rates in sales of new BEVs but conservatively assumes growth rates that are both lower than at present and that decrease over time.

This, of course, assumes the market can supply that many vehicles. Already, supply is a larger constraint on adoption than demand,[xliv]



a problem that may continue for an indefinite number of years as the kinks in the battery supply chain get worked out. But if supply can't catch up with demand the mandate will only create more hardship for New York auto consumers.

As a final note, New York could support BEV growth by allowing direct sales of electric vehicles. Currently, direct sales by manufacturers of electric vehicles are prohibited with the exception of five Tesla showrooms. Both free market advocates and environmentalists, believe that direct sales would support continued growth in electric vehicle sales.[xlv]

CONCLUSION: LEAVE CONSUMERS ALONE AND LET THE TRANSITION HAPPEN NATURALLY

Despite subsidies and the encouragement of advocates, many consumers still prefer not to buy a zero-emission vehicle – which are primarily battery-electric vehicles – due to concerns about price, range, and availability of recharging stations. New York's ZEV mandate will impose heavy costs on auto consumers. Because this will push many consumers into the used car market, it will likely push up prices there, meaning the impact of the policy will fall particularly heavily on moderate- to low-income consumers. In addition, the mandate will have disparate effects regionally, as upstate New Yorkers have much lower rates of BEV ownership.

The effects of the mandate in achieving its goals are likely to be minimal for several reasons. First, New York's light-duty vehicle greenhouse gas emissions are too minuscule to have a measurable effect on global temperatures.

Second, those who can afford new cars and are not ready to switch to BEV vehicles may either buy a new vehicle in a neighboring state or buy imported, lightly-used (functionally new) ICE vehicles.

Finally, while the market is unlikely to meet the state's unrealistic short-term goals, growing intrinsic demand for BEVs and – over time – increasing mitigation of consumers' concerns about price parity, range, and availability of charging infrastructure, make it plausible that natural market demand will lead to sufficient growth in BEVs to meet the state's longer-term goals for reduction in greenhouse gas emissions from light-duty vehicles.

In summary, it appears that the market will work in meeting the state's long-term climate goals, insofar as light-duty vehicles are concerned, and will do so without imposing costly mandates on individuals who cannot afford them.

That's why it should be allowed to work without interference – and the state should repeal its 2035 zero-emission vehicle mandate.

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[vi]Author's calculation based on DMV data.

[vii]Based on data accessed through a Freedom of Information Law request. DMV states that this data excludes most plug-in hybrid electric vehicles (PHEVs). NYSERDA has reported as many as 109,000 electric vehicles on the road as of July 1, 2021, but their data includes PHEVs, which, having an internal combustion engine, are likely to be prohibited in new car sales as of 2035. New York State Energy Research and Development Agency. https://www.nyserda.ny.gov/All-Programs/ChargeNY/Support-Electric/Map-of-EV-Registrations.

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