Macroeconomic Analysis of Clean Vehicle Policy Scenarios for Illinois

Natural Resources Defense Council

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EXECUTIVE SUMMARY

Synapse Energy Economics (Synapse) was commissioned by the Natural Resources Defense Council (NRDC) to analyze the macroeconomic impacts of light-duty vehicle greenhouse gas (GHG) standards and zero emission vehicle (ZEV) policies in the state of Illinois.

Synapse examined the difference in Illinois employment and gross domestic product (GDP) between a baseline defined as the current U.S. Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) SAFE 2 rule and three policy scenarios: (1) adoption of clean car standards, including GHG and ZEV standards, that are currently being implemented in eleven states;[1] (2) achievement of Governor Pritzker's goal of 750,000 ZEVs by 2030; and (3) achievement of 100 percent ZEV sales by 2035. Each scenario also reflects the resulting increased adoption of low-emission vehicles (LEVs).

Synapse used the IMPLAN economic input-output model to evaluate impacts on employment and GDP over the period from 2025 through 2040. Our analysis accounted for effects associated with the increased up-front costs of lower-emitting vehicles, reduced gasoline expenditures, and increased spending on electricity.

This analysis found that each of the three policy scenarios is likely to result in small but positive long-term macroeconomic impacts in Illinois. For the study period of 2025 through 2040, Synapse estimates average net annual increases of approximately $413 million in GDP and 5,682 jobs for Policy Scenario 1; $938 million in GDP and 11,545 jobs for Policy Scenario 2; and, $2,428 million in GDP and 29,720 jobs for Policy Scenario 3.[2] These net positive impacts of cleaner vehicles are expected to grow over time as fuel savings accumulate and ZEVs become cheaper. Our analysis indicates that Illinois can achieve the health and environmental benefits of vehicle emission reductions while continuing to strengthen its economy.

[1] States that have adopted advanced clean car vehicle standards under Section 177 of the Federal Clean Air Act. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-10/ca_177_states.pdf.

[2] Throughout this report, we present employment impacts in terms of job-years. One job-year represents one job that lasts for one year.

1. INTRODUCTION

Illinois continues to examine strategies and policies to support the adoption of electric vehicles (EV) and reduce greenhouse gas (GHG) emissions in the transportation sector. In 2019, Governor Pritzker signed Executive Order 2019-06, which resulted in Illinois joining the U.S. Climate Alliance and committing to the principles of the Paris Climate Agreement.

Then in May of 2020, following the U.S. Environmental Protection Agency's (EPA) and the National Highway Traffic and Safety Administration's (NHTSA) roll-back of the federal GHG emission and fuel economy standards for cars and light trucks, Illinois and 22 other states and the District of Columbia filed a joint lawsuit in the Court of Appeals for the D.C. Circuit.

Shortly thereafter, Governor Pritzker issued an eight-principle clean energy proposal on August 20, 2020. The proposal includes strong recommendations for Illinois to further support the EV industry to help set the state up to be a significant manufacturing competitor in the United States and abroad. Stating his intention for "Illinois become the best state in the country for electric vehicle producers and consumers," the Governor recommends an increase in the adoption of EVs in the state to 750,000 by 2030.[3]

While Illinois has fewer than 25,000 registered EVs today,[4] it has already been ranked nationally in the top 10 for the number of facilities developing clean and fuel-efficient vehicle technologies. The state has 9,904 employees across 44 such facilities.[5] With over 34 percent of spending on the auto manufacturing industry in Illinois expected to stay in the state[6], it is expected that increased adoption of EVs and stronger fuel economy standards in the state would have positive economic outcomes.

To assess this potential, Synapse examined the difference in Illinois employment and gross domestic product (GDP) between a baseline defined as the current EPA and NHTSA SAFE 2 rule and three policy scenarios: (1) adoption of low emission vehicle (LEV) tailpipe standards for criteria pollutants and GHGs, and zero emission vehicle (ZEV) regulations, that together are currently being implemented in eleven

[3] State of Illinois, Office of Governor JB Pritzker. 2020. *Putting Consumers & Climate First: Governor Pritzker's Eight Principles for a Clean & Renewable Illinois Economy*. Available at: https://www2.illinois.gov/IISNews/21974-Putting_Consumers_Climate_First-Governor_Pritzkers_Eight_Principles_for_a_Clean_Renewable_Illinois_Economy.pdf.

[4] Ibid.

[5] Natural Resources Defense Council and Blue-Green Alliance. 2017. *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel-Efficient Vehicle Technologies*. Available at https://www.nrdc.org/sites/default/files/supplying-ingenuity-clean-vehicle-technologies-report.pdf.

[6] According to IMPLAN data, 34.72 percent of spending on the auto manufacturing industry in Illinois stays in Illinois.

states;[7] (2) the LEV standards with increased ZEV penetration that achieves Governor Pritzker's goal of 750,000 ZEVs by 2030; and (3) the LEV standards with further ZEV penetration that achieves 100 percent ZEV sales by 2035.

This analysis was based primarily on inputs provided by Shulock Consulting and data from a recent Illinois EV scenario cost-benefit analysis conducted by M.J. Bradley.[8] We used the IMPLAN macroeconomic model to evaluate the impacts of the three policy scenarios on the Illinois economy over the years 2025 through 2040.

2. Methods and Assumptions

Synapse used two separate models to analyze the impacts of each policy scenario. First, we used a spreadsheet-based Total Cost of Ownership (TCO) model to assess the vehicle sales and fuel savings impacts for each policy scenario. The TCO model accounts for a range of factors considered by a typical prospective purchaser of a new vehicle to determine the change in the perceived lifetime vehicle ownership costs resulting from each policy scenario. Second, we used an IMPLAN-based macroeconomic impact model to analyze employment and GDP impacts. These two sets of models are complementary, as the macroeconomic impact model relies on outputs from the TCO model to produce results regarding the impact of each policy scenario on the macroeconomy.

2.1. Total Cost of Ownership Methodology

Synapse used a TCO model to assess the impacts of each policy scenario on vehicle sales. The TCO model is distinguished by its accounting for factors beyond the purchasing price of lower-emission vehicles when evaluating the impact of a change in policy on vehicle ownership costs and vehicle sales. Our TCO model incorporates such key factors as financing options, insurance costs, and consumer valuation of fuel savings.[9] In general, the relationship between vehicle standards and vehicle sales depends on two primary factors: (1) the perceived total incremental cost of a new vehicle compliant with the policy scenario relative to a vehicle that complies with existing federal standards (referred to as "net price premiums" because they are compliance costs net of factors such as consumer valuation of fuel savings)

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[7] States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-10/ca_177_states.pdf

[8] M.J. Bradley and Associates, LLC. September 2017. *Electric Vehicle Cost-Benefit Analysis: Plug-in Electric Vehicle Cost-Benefit Analysis: Illinois*. Available at: https://mjbradley.com/sites/default/files/IL%20PEV%20CB%20Analysis%20FINAL%2026sep17.pdf.

[9] The Synapse TCO model goes beyond a more traditional TCO model in several ways, most notably that it incorporates consumer valuation of fuel savings and the impact of price on sales into its functionality.

and (2) the responsiveness of the demand for new vehicles to changes in net price premiums (known as the price elasticity of demand).

We evaluated the effects of each policy scenario on sales of cars and light trucks from 2025 through 2040. We measured all vehicle sales impacts of each policy scenario relative to a baseline where the current EPA and NHTSA SAFE 2 rule remains in place.

2.2. Macroeconomic Analysis Methodology

Synapse evaluated the macroeconomic impacts for each policy scenario using two separate but related components: (1) a transition towards more fuel-efficient internal combustion engine (ICE) vehicles and (2) increased penetration of EVs. We used the IMPLAN model to project GDP and employment impacts over the period from 2025 through 2040, and to compare each policy scenario to the baseline of the current EPA and NHTSA SAFE 2 rule. IMPLAN is an economic input-output model that uses historical data to evaluate state-specific impacts from an initial change in economic activity.[10]

We modeled three primary pathways through which the development of lower-emission vehicles impacts the Illinois macroeconomy:

1. **Auto sector investment.** This pathway accounts for the impacts of incremental up-front vehicle costs on the auto sector and its suppliers. This includes both increased purchases of batteries and related EV infrastructure and increased investment in cleaner and/or more fuel-efficient technologies for gas-powered internal-combustion engine (ICE) vehicles. This pathway also accounts for changes in vehicle sales driven by the net price premiums associated with more efficient vehicles.

2. **Electric sector investment.** This pathway traces economic impacts associated with increased electricity consumption by new EV owners.

3. **Gasoline spending reduction.** This pathway accounts for the impacts of reduced expenditures on gasoline resulting from the combination of a shift from ICE vehicles to EVs and the use of more fuel-efficient ICE vehicles.

Within each of these pathways, we considered three types of economic impacts:

- **Direct impacts:** These are changes in employment and GDP in sectors immediately impacted by clean car regulations. For example, these include changes in employment in the auto manufacturing sector resulting from the need to incorporate cleaner and/or fuel-saving technologies in future cars.

- **Indirect impacts:** These are changes in employment and GDP within industries that serve as suppliers to the directly affected industries.

[10] This study used the 2018 IMPLAN data set for Illinois.

- **Induced impacts:** These are changes in employment associated with shifts in consumer spending in the wider economy. Employees in directly and indirectly impacted industries may have more (or less) disposable income, leading to more (or less) consumer spending. Induced effects also arise when consumers re-spend much or all their gasoline savings resulting from the use of more fuel-efficient vehicles, and when new EV purchasers have more or less disposable income to spend on the broader economy based on the price of an EV relative to an ICE vehicle.

Under this modeling framework, every direct impact is offset to at least some degree by an induced impact that works in the opposite direction. If a policy scenario drives decreased spending on gasoline, it results in increased spending on other industries, as consumers re-spend their gas savings elsewhere. Similarly, if increased EV penetration results in increased spending on batteries and electric power plants, consumers have less money left to spend on other industries.

2.3. Key Input Assumptions

Our analysis necessarily relied on a host of assumptions regarding vehicle costs, fuel prices, fuel economy levels, and other relevant parameters. The most important of these inputs are identified below. In general, our assumptions relied heavily on inputs provided by Shulock Consulting and data from a recent Illinois ZEV scenario cost-benefit analysis conducted by M.J. Bradley.[11]

ICE Compliance Costs

Shulock Consulting provided incremental costs for ICE vehicles complying with Policy Scenario 3 compared to the baseline as shown in Table 3. To determine the incremental costs for Policy Scenarios 1 and 2, we converted the GHG emission standards into miles-per-gallon (mpg) equivalency and calculated a dollar per mpg compliance cost using the incremental cost for Policy Scenario 3 divided by the difference in mpg between Policy Scenario 3 and the current SAFE 2 Standards. This dollar per mpg value was then applied to the difference in mpg between the baseline and Policy Scenarios 1 and 2.

Table 1 and Table 2 below show the result of applying the $/mpg to the difference in mpg between the baseline and Policy Scenario 1 and 2. Table 3 shows the data provided from Shulock Consulting. Each table provides the difference in Illinois GHG standard compliance costs for each policy scenario, only for the ICE portion of the vehicle fleet, relative to a baseline of compliance with the current EPA and NHTSA's SAFE 2 rule.

[11] M.J. Bradley & Associates. 2017.

Table 1. Policy Scenario 1: Incremental Costs to meet increasing GHG standards associated with the adoption of a clean car standard (relative to baseline) (2020$/Vehicle)

Vehicle Type	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Passenger Cars	$684	$626	$623	$619	$616	$614	$611	$608	$605	$603	$603
Light Trucks	$914	$846	$846	$843	$842	$841	$838	$834	$830	$826	$826

Table 2. Policy Scenario 2: Incremental Costs to meet increasing GHG standards associated with the achievement of Governor Pritzker's goal of 750,000 ZEVs by 2030 (relative to baseline) (2020$/Vehicle)

Vehicle Type	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Passenger Cars	$684	$624	$618	$612	$606	$602	$595	$590	$585	$580	$580
Light Trucks	$914	$842	$838	$832	$827	$823	$816	$809	$803	$797	$797

Table 3. Policy Scenario 3: Incremental Costs to meet increasing GHG standards associated with the achievement of 100 percent ZEV sales by 2035 (relative to baseline) (2020$/Vehicle)

Vehicle Type	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Passenger Cars	$688	$630	$627	$623	$620	$618	$614	$611	$608	$606	$0
Light Trucks	$919	$850	$850	$847	$846	$845	$841	$837	$833	$829	$0

EV Price Premium

EV price premiums constitute the incremental up-front cost of an EV relative to a standard new ICE vehicle. Synapse based its assumptions for the incremental cost of a new EV relative to a new ICE on data from the International Council on Clean Transportation's (ICCT) EV cost report from 2019 (See Figure 1).[12] These costs are broken out by type of EV and electric range. Figures 1-4 show costs broken out for BEV 250 (an all-electric vehicle with a 250-mile electric range), BEV 150 (an all-electric vehicle with a 150-mile electric range), BEV 100 (an all-electric vehicle with a 100-mile electric range), and PHEV 50 (a plug-in hybrid with a 50-mile electric range). Because this report does not contain information specific to light-duty trucks, we used the price premiums for sports utility vehicles (SUV) as a proxy.

Since the ICCT's cost projections end in 2030, we extended the cost projections out through the study period by continuing the cost decline of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) until the associated battery pack cost reached the low cost case developed by Bloomberg New Energy Finance.[13] After this happens in 2032, due to limited availability of data we assume that cost differences are constant. The ICCT projects that BEV 250, BEV 200, and BEV 150 will all reach cost parity prior to 2030, while PHEV 50 will not. Figure 1, Figure 2, Figure 3, and Figure 4 present the resulting forecast.

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[12] Lutsey, N., M. Nicholas. 2019. *Update on electric vehicle costs in the United States through 2030.* The International Council on Clean Transportation

[13] Henze, Veronika. December 2020. "Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137/kWh." *BloombergNEF.* Available at: https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/

Figure 1. Vehicle price projections for cars

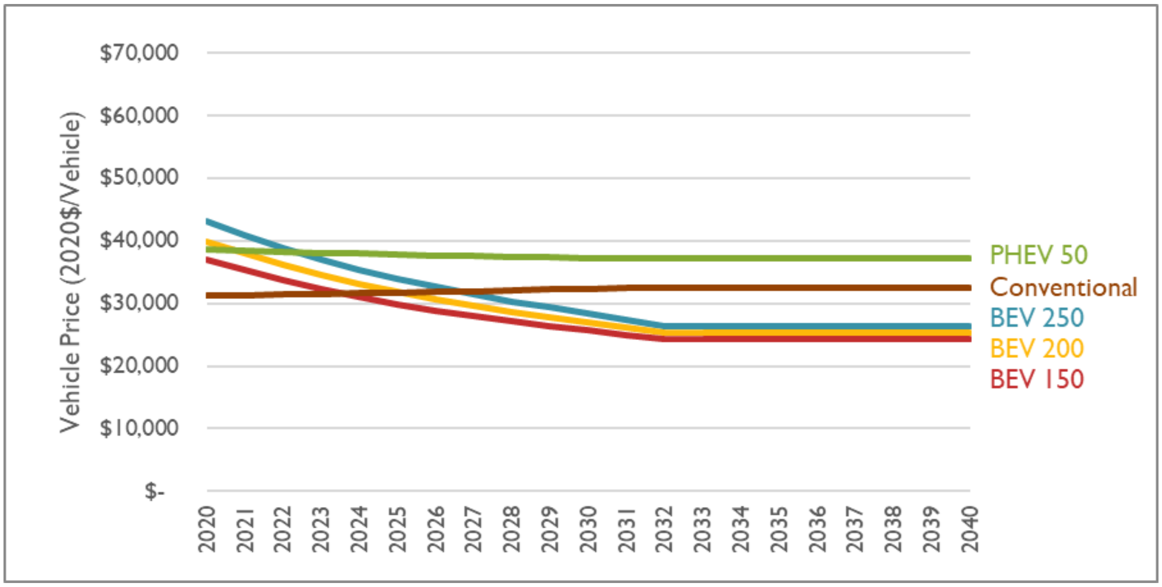


Figure 2. Vehicle price projections for sports utility vehicles

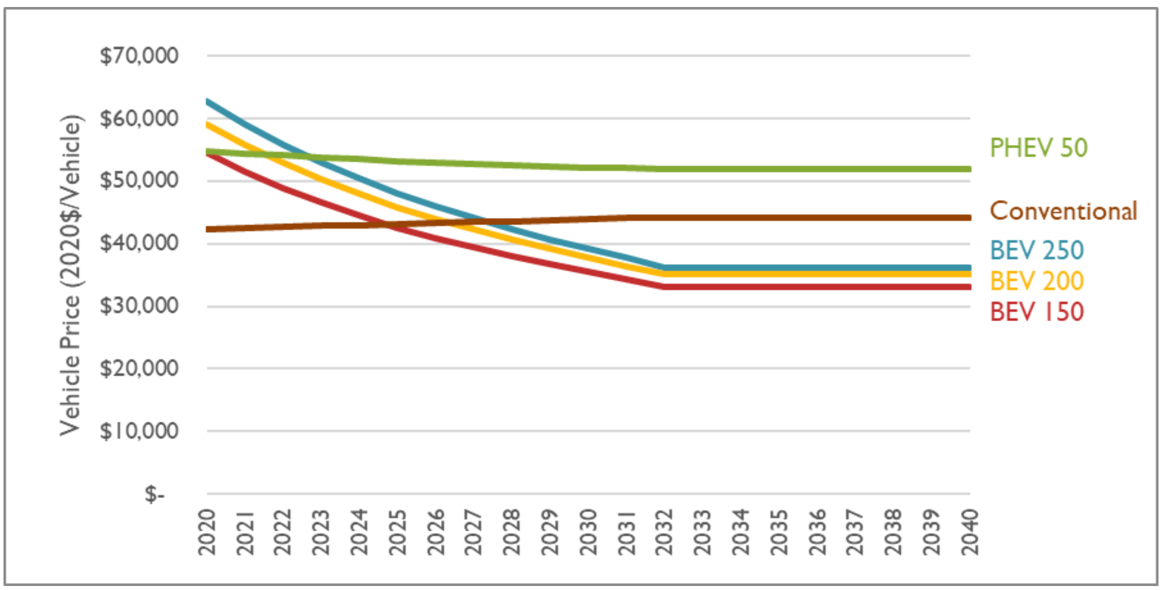


Figure 3. Light-duty electric car price premiums

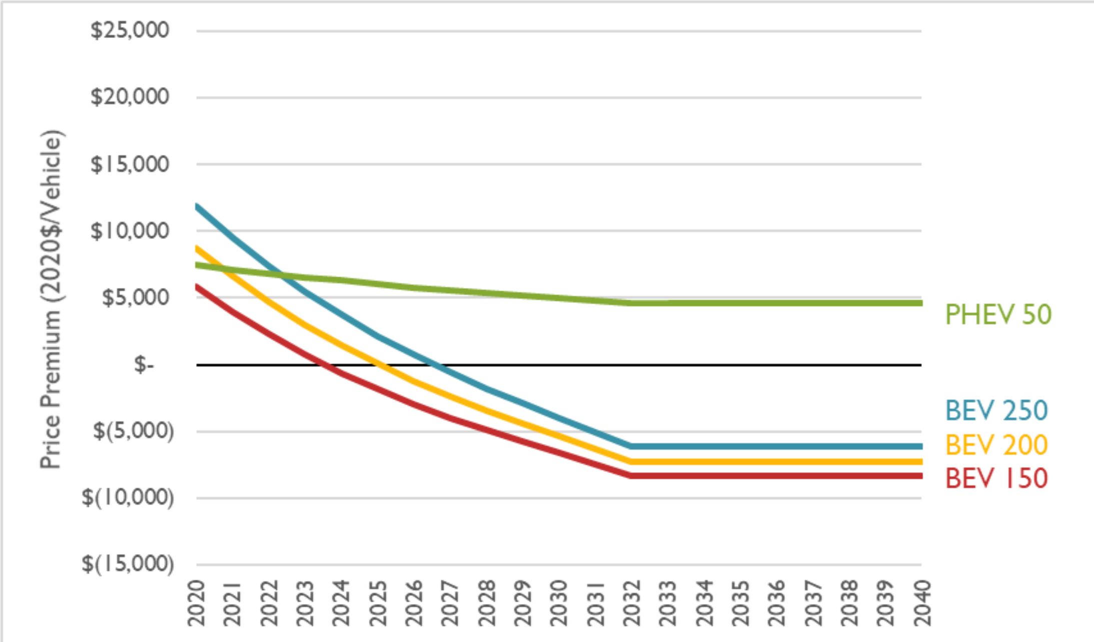
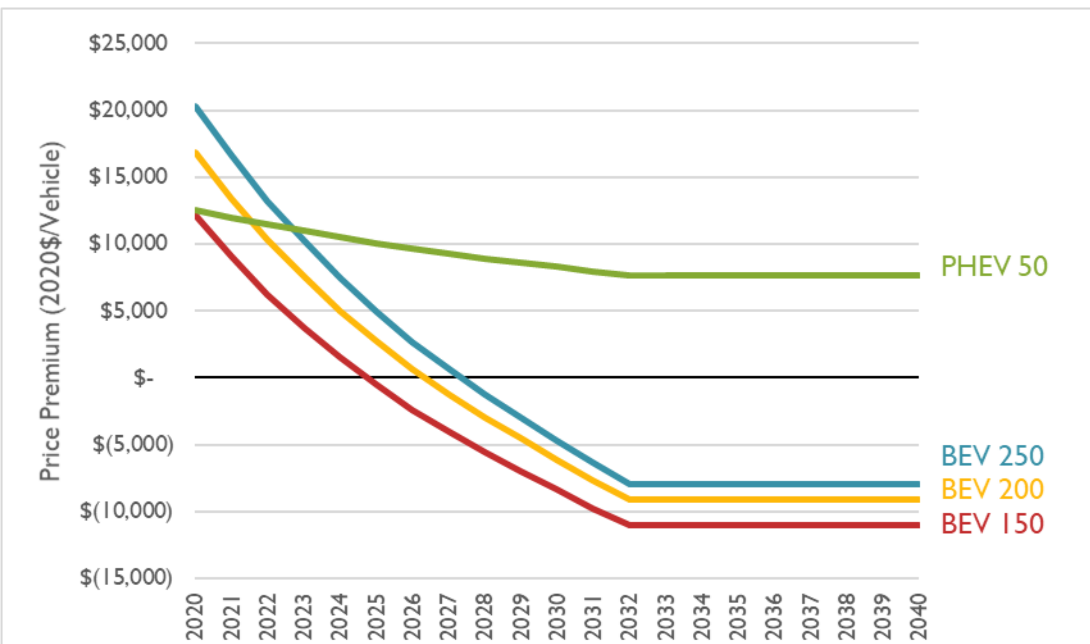


Figure 4. SUV electric car price premiums to be used as a proxy for light-duty trucks



Estimated CO_2 and Fuel Economy Levels

The estimated fuel economy assumptions for Policy Scenarios 1, 2, and 3 compared to the baseline were obtained from Shulock Consulting. For the baseline, we relied on the estimated required average carbon dioxide standards for passenger and light-truck fleets as included in the Final EPA and NHTSA Regulatory Impact Analysis (FRIA).[14]

Table 4. Baseline CO2 requirements (CO_2 g/mi) for each model year (MY)

Policy Scenario	Vehicle Type	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032	MY 2033	MY 2034	MY 2035
Baseline	Cars	167	165	165	165	165	165	165	165	165	165	165
Baseline	Light Trucks	245	240	240	240	240	240	240	240	240	240	240

These values were then converted to on-road fuel economy levels in order to conduct the analysis.

Gasoline Prices

Synapse used a gasoline price forecast based on historical data and projections from the U.S Energy Information Administration (EIA). The forecast starts with 2019 and 2020 prices from the EIA Gasoline and Diesel Weekly Retail Prices for Chicago.[15] Gas prices are then assumed to increase at annual growth rates projected for the East North Central region in EIA's Annual Energy Outlook (AEO) 2020 Reference case.[16]

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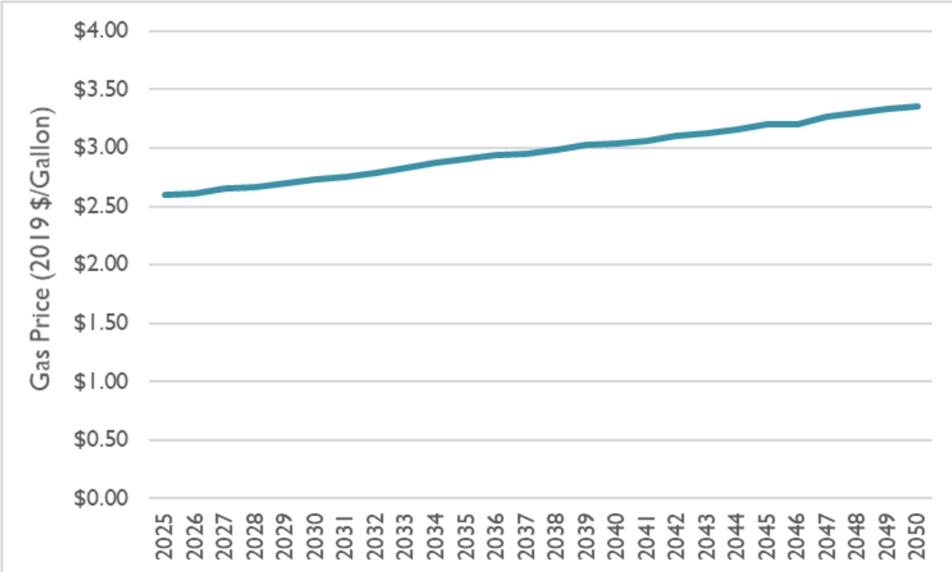
[14] NHTSA and EPA. The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks. Tables II-1 and II-2. Available at: https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-al76_epa_pria_181016.pdf.

[15] U.S. EIA. Weekly Retail Gasoline and Diesel Prices for Chicago. https://www.eia.gov/opendata/qb.php?sdid=PET.EMM_EPM0_PTE_YORD_DPG.W.

[16] U.S. EIA. 2020. Annual Energy Outlook (AEO) 2020. Table 59.8: Components of Selected Petroleum Product Prices, East North Central Region. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=70-AEO2020&region=1-3&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.15-70-AEO2020.1-3&map=ref2020-d112119a.4-70-AEO2020.1-3&ctype=linechart&sourcekey=0.

Figure 5. Illinois retail motor gasoline price projection (2019 $/Gallon)



Vehicle Sales and Costs

For the baseline for new vehicle sales, Synapse used AEO 2020 light-duty vehicle sales projections, for all vehicle types, for the East North Central region.[17] We assume that car and light-truck sales will increase at annual growth rates projected for the East North Central Region in the AEO 2020 Reference case.[18]

Since the AEO East North Central region encompasses more than just Illinois, we used the most recent year of Illinois-specific sales data from the Auto Alliance (2018) to determine the percentage of Illinois to East North Central regional sales for that same year.[19] The resulting percentage of 26 percent was then applied to the AEO 2020 light-duty vehicle sales projections to determine the Illinois-specific sales forecast.

For each policy scenario, we applied a price elasticity factor to the increase in costs to determine the impact on sales. We assumed a price elasticity of new vehicle demand of -1.0. That is, for a 1 percent increase in vehicle cost (or perceived vehicle cost, also referred to as the net price premium), demand for new vehicles will decrease by 1 percent.

Figure 6 shows our baseline projection of new light-duty vehicle sales.

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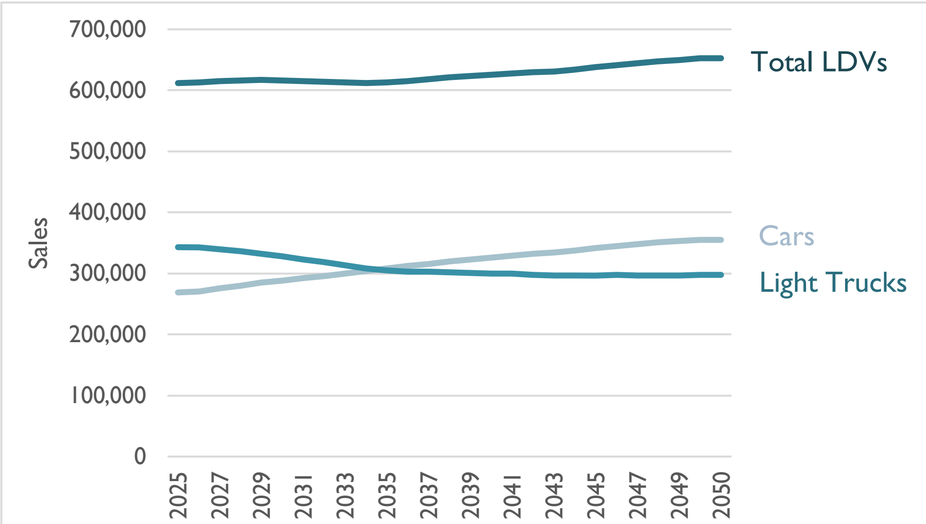
[17] U.S. EIA. 2020. AEO 2020. Table 39.8: Light-Duty Vehicle Sales by Technology Type, East North Central Region. Accessed on December 2, 2020. Available at: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2020&region=1-3&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.4-48-AEO2020.1-3&map=ref2020-d112119a.5-48-AEO2020.1-3&sourcekey=0

[18] U.S. EIA. 2020.

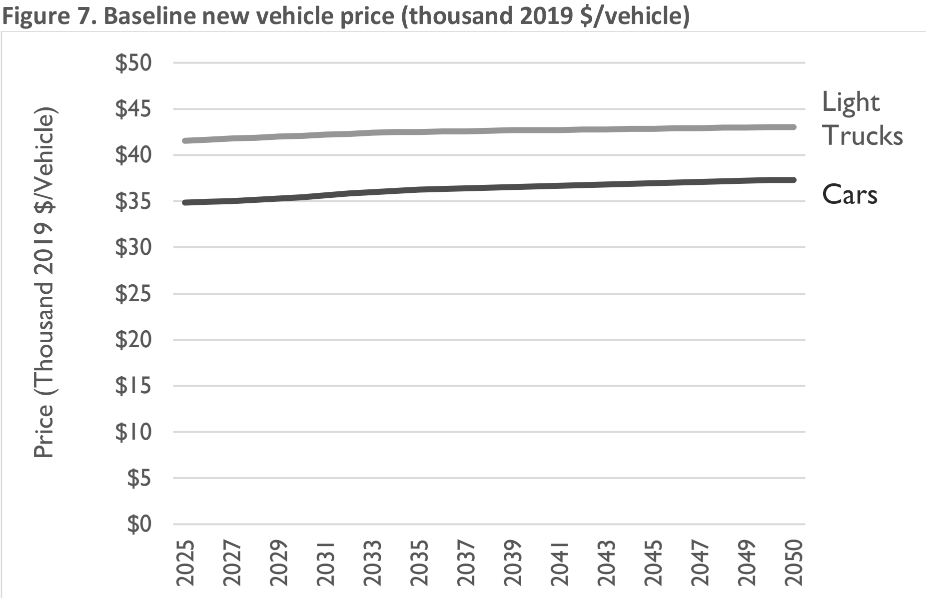
[19] Auto Alliance. *Illinois 2018 Total New Car Sales*. Available at: https://autoalliance.org/in-your-state/IL/

Figure 6. Baseline new vehicle sales



We assumed the baseline average new vehicle prices consistent with AEO 2020 projections (see Figure 7).[20]

Figure 7. Baseline new vehicle price (thousand 2019 $/vehicle)



[20] U.S. EIA. 2020. AEO 2020. Table 52. New Light-Duty Vehicle Prices. Reference Case. Available at: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=114-AEO2020&region=0-0&cases=ref2020&start=2018&end=2050&f=A&linechart=~~~~~~~~~~~~~~~&sourcekey=0

EV Sales

Each of the three policy scenarios relied on input assumptions developed by Shulock Consulting. For Policy Scenario 1, Synapse modeled exact compliance with Advanced Clean Cars GHG standards and ZEV requirements. For Policy Scenario 2, ZEV sales increase to reach Governor Pritzker's goal of 750,000 by 2030. In Policy Scenario 3, we assume aggressive ZEV policies to reach 100 percent ZEV sales by 2035. The data obtained from Shulock Consulting holds the ZEV sales percentages constant after 2035 and assumes that approximately 80 percent of new EVs will be BEVs and 20 percent will be PHEVs. In Policy Scenarios 2 and 3, the percent of BEVs increases over time. The resulting EV sales forecasts for each scenario are displayed in Figure 8 below.

Figure 8. Incremental Illinois EV sales by policy scenario

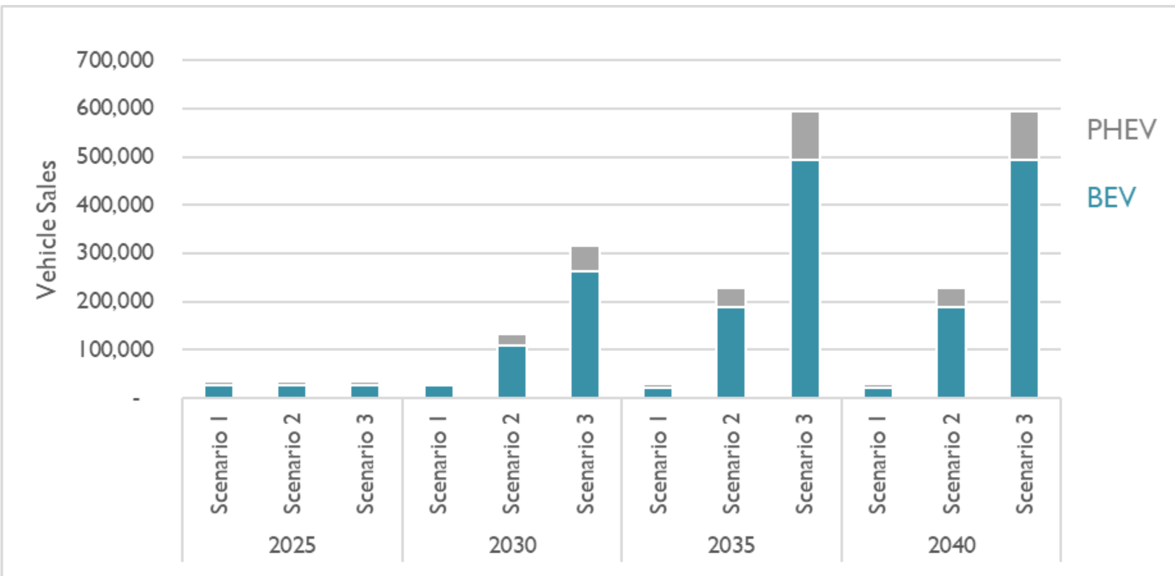


Figure 9, Figure 10, and Figure 11 below show a more detailed view of EV sales for each policy scenario.

Figure 9. Policy Scenario 1: Incremental Illinois EV sales

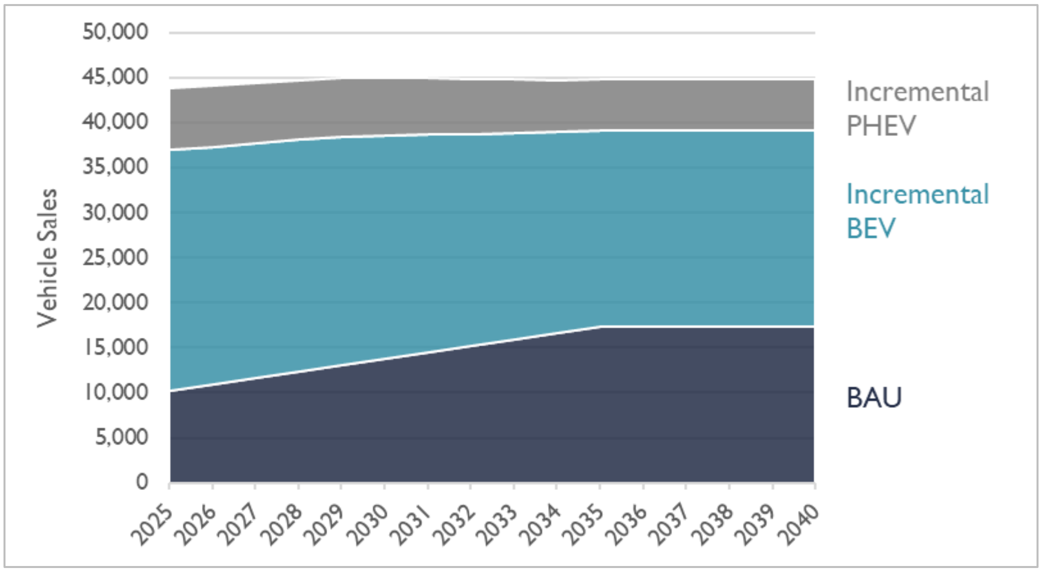


Figure 10. Policy Scenario 2: Incremental Illinois EV sales

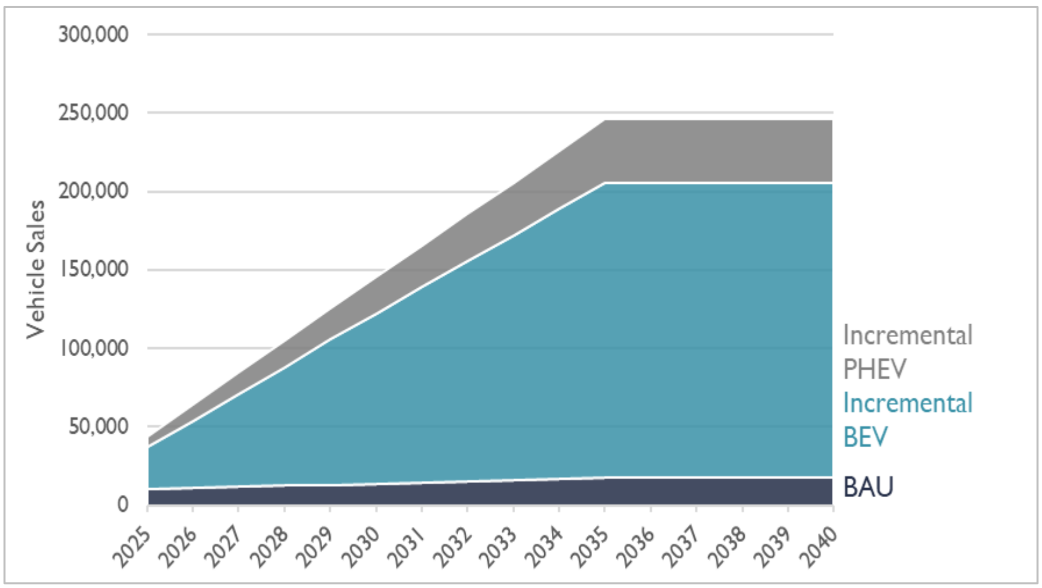
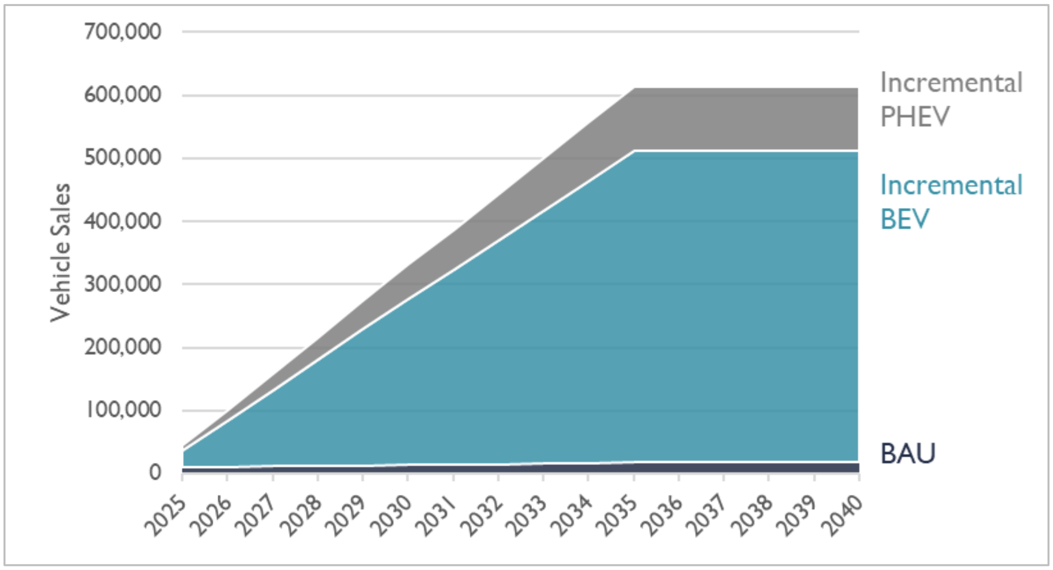


Figure 11. Policy Scenario 3: Incremental Illinois EV sales



Vehicle-Miles Traveled

For each policy scenario, we used vehicle-miles traveled data provided by Shulock Consulting.[21]

Consumer Financing

The tendency of consumers to finance their new vehicle purchases affects the timing and magnitude of re-spending effects associated with consumers spending more money on vehicles. We based our consumer financing assumptions on the latest Experian report on the state of the automotive financing market.[22]

We assumed 82.4 percent of consumers will finance their new vehicle purchase and such financing will occur at an interest rate of 4.22 percent and loan term of 5.8 years. We assumed these consumer financing patterns hold for EVs and ICE vehicles.

Electric Sector Costs

Increased EV penetration leads to increased investment in various components of the electric sector, including expenditures associated with additional generation, power plant capacity, and transmission and distribution upgrades. Our assessment of impacts related to electric-sector costs is based on outputs from M.J. Bradley's analysis. We did not undertake any additional electric-sector modeling for

[21] The vehicle-miles traveled data does not account for price elasticity.

[22] Experian. 2020. "Finance Market Report Q3 2020." *Automotive Industry Insights*. Available at https://www.experian.com/content/dam/marketing/na/automotive/quarterly-webinars/credit-trends/q3-2020-safm.pdf.

the purposes of this study. However, we did map incremental electric-sector costs to custom, resource-specific IMPLAN vectors. We discuss our treatment of each category of electric-sector cost below.

Generation Costs

In our analysis, electric sector costs are required to calculate (a) incremental electric bill increases for EV owners, and (b) increased operations and maintenance costs associated with the increase in transportation electrification. We used annual incremental bill costs in dollars per EV for calendar years and model years 2025 through 2040 provided by Shulock Consulting. We also relied on generation cost data from the recent Illinois ZEV scenario cost-benefit analysis conducted by M.J. Bradley and Associates, and scaled those costs using incremental generation data received from Shulock Consulting.[23]

Capacity-Related Costs

The modeling of capacity costs started with M.J. Bradley's projections of increased capacity (in MW) and capacity costs associated with its Moderate ZEV scenario. Next, we allocated incremental capacity across generation resource types using projections provided by NRDC for each resource type in each year for Illinois. Finally, we multiplied each resource's level of incremental capacity by AEO 2020 resource-specific projections of construction and fixed O&M costs.[24] This calculation resulted in resource-specific capacity costs that we trued-up with M.J. Bradley's capacity cost estimates and used as an input to IMPLAN.

Transmission and Distribution Costs

Transmission and distribution costs are an input to IMPLAN modeling due to the impact of increased EV penetration on electric sector demand.

We scaled M.J. Bradley's projections of EV-related transmission and distribution costs associated with its Moderate ZEV scenario for Policy Scenarios 1 and 2 and costs associated with its High ZEV scenario for Policy Scenario 3 based on our EV sales trajectory for each policy scenario for use as inputs in IMPLAN.

EV Tax Credits

Synapse included assumptions regarding federal tax credits within the modeling framework. Federal EV tax credits do offer a potential benefit to Illinois consumers, although the credit is not in place for every EV manufacturer and will likely phase out over time. Under current law, the federal EV tax credit is set at

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[23] M.J. Bradley and Associates, LLC. September 2017. *Electric Vehicle Cost-Benefit Analysis: Plug-in Electric Vehicle Cost-Benefit Analysis: Illinois*.

[24] U.S. EIA. 2020. AEO 2020, Cost and Performance Characteristics of New Generating Technologies. https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf.

$7,500 for any EV purchased from a manufacturer with less than 200,000 total sales.[25] The $7,500 tax credit is reduced by 50 percent to $3,750 six months after a manufacturer reaches 200,000 in total EV sales. Six months later, the tax credit is again reduced by 50 percent to $1,875. The credit remains at this level for an additional six months before completely phasing out for that manufacturer, 18 months after reaching 200,000 in total EV sales.[26]

In 2018, Tesla and General Motors became the only two manufacturers to have achieved this level of sales.[27] No other manufacturer appears likely to reach 200,000 in total EV sales until 2022/2023, with Ford, Nissan, and Toyota being next in line.[28] Based on cumulative manufacturer EV sales through June 2020 and our EV growth forecast, we created a forecast that projects what year each manufacturer is likely to begin the tax credit phase-out. In cases where manufacturers are not projected to reach 200,000 PEV sales by 2030, we manually set 2030 as the start of that manufacturers phase-out. A total of 19 manufacturers were included in this projection, with a mean phase-out year of 2027. Using this method (and expressing values in nominal terms), we arrived at a tax credit of $7,500 for each PEV sale through 2027, a tax credit of $2,813 in 2028 (the average of the two-credit phase-out levels), and no tax credits beyond 2029.

However, because the two largest manufacturers by total sales have already completely phased out the tax credit and will continue to sell high numbers of EVs, we adjust the tax credit assumptions further to reflect the market share of Tesla and GM. Between 2010 and 2020, Tesla accounted for 38.7 percent of EV sales and GM accounted for 15.0 percent of sales, for a combined market share of 53.7 percent. The percentage of sales from manufacturers that still qualify for the tax credit is 46.3 percent. To reflect the fact that over 50 percent of sales might come from manufacturers without the tax credit, we multiply the forecast tax credit across all years by 46.3 percent to capture the average tax credit per EV sold. Table 5 shows our final assumed federal PEV tax credit values.

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[25] $7,500 is the maximum level of the federal tax credit. The base tax credit is $2,500 plus incremental increases depending on the capacity of the vehicle battery, so the applied tax credit for certain PEV models is less than $7,500. For the purposes of this study, we assume that all vehicles that receive a federal tax credit begin at the maximum level of $7,500. A full list of individual PEV models and the impact of their battery size on federal tax credits is available at the U.S. Department of Energy Fuel Economy website: https://www.fueleconomy.gov/feg/taxevb.shtml#:~:text=Federal%20Tax%20Credit%20Up%20To,local%20incentives%20may%20also%20apply.

[26] Internal Revenue Service, "Plug-In Electric Vehicle Drive Credit," https://www.irs.gov/businesses/plug-in-electric-vehicle-credit-irc-30-and-irc-30d; U.S. Department of Energy, "Alternative Fuels Data Center: Qualified Plug-In Electric Vehicle Tax Credit," https://afdc.energy.gov/laws/409.

[27] EV Adoption, "Federal EV Tax Credit Phase Out Tracker by Automaker," https://evadoption.com/ev-sales/federal-ev-tax-credit-phase-out-tracker-by-automaker/.

[28] Ibid.

Table 5. Projected federal PEV tax credit phase-out

Year	Assumed Federal EV Tax Credit (Nominal $)
2020	$3,473
2021	$3,473
2022	$3,473
2023	$3,473
2024	$3,473
2025	$3,473
2026	$3,473
2027	$1,302
2028	$0
2029	$0
2030	$0

There is no state-level EV tax credit in Illinois. While there are some incentive programs, including registration fee waivers for fleets of EVs and inspection waivers, these are not included in our assumptions based on their limited magnitude and scope.[29] State level rebates have been shown to further incentivize customer adoption of EVs. A recent survey of California's incentive found that 73 percent of survey respondents indicated that the state rebate was very important or extremely important in their decision to purchase an EV.[30] A similar analysis based on a regression of vehicle purchase data from 2008–2016, found that tax incentives and charging infrastructure significantly influence per capita PEV purchases. And within those tax incentives, rebates were generally more effective than tax credits.[31]

[29] U.S. Department of Energy, "Alternative Fuels Data Center: Illinois Laws and Incentives," https://afdc.energy.gov/laws/state_summary?state=IL.

[30] Hardman, S. et al. 2017. "The effectiveness of financial purchase incentives for battery electric vehicles – A review of the evidence". *Renewable and Sustainable Energy Reviews,* Volume 80, December 2017, Pages 1100-1111.

[31] Narassimhan, E. and Johnson, C. 2018. "The role of demand-side incentives and charging infrastructure on plug-in electric vehicle adoption: analysis of US States". Available at: https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf.

3. RESULTS

Our analysis indicates that, compared to the existing SAFE 2 rule, each policy scenario is likely to result in small but positive macroeconomic impacts in Illinois over the long term. Table 6 presents the cumulative direct spending impacts by sector for each policy scenario.

3.1. Changes in Direct Spending

Table 6. Change in direct spending over 2025–2040 by policy scenario

	Spending Change (2020 $Million)		
Spending Category	**Policy Scenario 1**	**Policy Scenario 2**	**Policy Scenario 3**
Goods			
Vehicles	$16,071	$4,614	-$22,684
Generic Consumer Goods	$10,061	$20,203	$55,054
Energy			
Electricity	$989	$4,264	$10,280
Gasoline	-$27,933	-$31,611	-$55,038
Total	***-$811***	***-$2,530***	***-$12,387***

Policy Scenario 1 examines the impact of Illinois adopting clean car standards, including GHG and ZEV requirements. We find that this scenario will result in increased spending of more than $16 billion on new vehicles and more than $989 million on electricity from 2025 through 2040. We also forecast that vehicle owners will save more than $27 billion on gasoline over this time. Even after accounting for increased electric spending by EV owners, this amounts to nearly $26 billion in total fuel savings within Illinois, or more than $1.6 billion on average per year.

Policy Scenario 2 has more aggressive ZEV penetration than Policy Scenario 1. It assumes the achievement of Governor Pritzker's goal of 750,000 ZEVs by 2030. This scenario creates less spending on vehicles compared to Policy Scenario 1 but more spending on electric vehicle supply equipment (EVSE) as well as consumer goods due to increased savings in gasoline. Specifically, we project increased spending of more than $4 billion on new vehicles and more than $4 billion on electricity from 2025 through 2040. We also forecast that vehicle owners will save more than $31 billion on gasoline over this time. Even after accounting for increased electric spending by EV owners, this amounts to nearly $27 billion in total fuel savings within Illinois, or more than $1.7 billion on average per year.

Policy Scenario 3, with the greatest number of ZEVs, will result in reduced spending on new vehicles from 2025 through 2040 due to declining costs of EVs compared to ICE vehicles. We also forecast that vehicle owners will save more than $55 billion on gasoline over this time. Even after accounting for increased electric spending of $10 billion by EV owners, this amounts to over $44 billion in total fuel savings within Illinois, or more than $2.7 billion on average per year.

3.2. Changes to Employment and GDP

Fuel savings are the key driver of these positive overall results. Fuel savings produce macroeconomic benefits within Illinois because gasoline is more capital- and import-intensive relative to the rest of the Illinois economy. Thus, when drivers in Illinois save on gasoline and re-spend their savings elsewhere, they generally increase in-state employment and GDP.[32] Besides generating net fuel savings, increased EV penetration causes a shift in fuel expenditures from the petroleum sector to the electric sector.

The combination of these spending changes results in positive employment and GDP impacts for each policy scenario as follows:

- Policy Scenario 1 results in a net average annual increase of 5,682 jobs (in job-years) and $413 million in GDP over the period from 2025 through 2040.
- Policy Scenario 2 results in a net average annual increase of 11,545 jobs (in job-years) and $938 million in GDP over the period from 2025 through 2040.
- Policy Scenario 3 results in a net average annual increase of 29,720 jobs (in job-years) and $2,428 million in GDP over the period from 2025 through 2040.

In Table 7, Table 8, and Table 9 we provide a more granular break out of the job-year impacts in terms of direct, indirect, and induced impacts for three points in time over the study period. Given the existence of a strong auto industry in Illinois, our analysis shows that for each policy scenario, in general, most of the employment impacts will be direct jobs (in job-years).

Table 7. Policy Scenario 1: Direct, indirect, and induced job-year impacts for 2030, 2035, and 2040

Job Impact Type	2030	2035	2040
Direct	1,020	4,040	5,490
Indirect	810	1,630	2,010
Induced	1,020	2,340	2,970
Total	**2,850**	**8,010**	**10,470**

Table 8. Policy Scenario 2: Direct, indirect, and induced job-year impacts for 2030, 2035, and 2040

Job Impact Type	2030	2035	2040
Direct	2,180	8,800	12,350
Indirect	1,120	3,170	4,350
Induced	1,650	4,870	6,750
Total	**4,950**	**16,840**	**23,450**

[32] Throughout this report, we present employment impacts in terms of job-years. One job-year represents one job that lasts for one year.

Table 9. Policy Scenario 3: Direct, indirect, and induced job-year impacts for 2030, 2035, and 2040

Job Impact Type	2030	2035	2040
Direct	4,490	22,160	44,630
Indirect	1,770	6,050	12,500
Induced	2,970	10,940	21,350
Total	**9,230**	**39,150**	**78,480**

Our results show that employment and GDP benefits grow as each policy scenario becomes more aggressive in its assumed number of LEVs and ZEVs in Illinois. The macroeconomic benefits of each policy scenario also increase over time due to the combination of dropping EV battery prices and the accumulation of fuel savings from an ever-increasing number of efficient vehicles on the road. These benefits do not incorporate potential societal benefits from associated GHG emission reductions, criteria emission reductions, or reduced petroleum dependency. This long-term trend can be seen in the figures below.

Figure 12 and Figure 13 provide for a comparison of GDP impacts across all three scenarios, whereas Figure 14, Figure 15, and Figure 16 display a more detailed view for each policy scenario.

Figure 12. All Scenarios: Net annual Illinois GDP impact

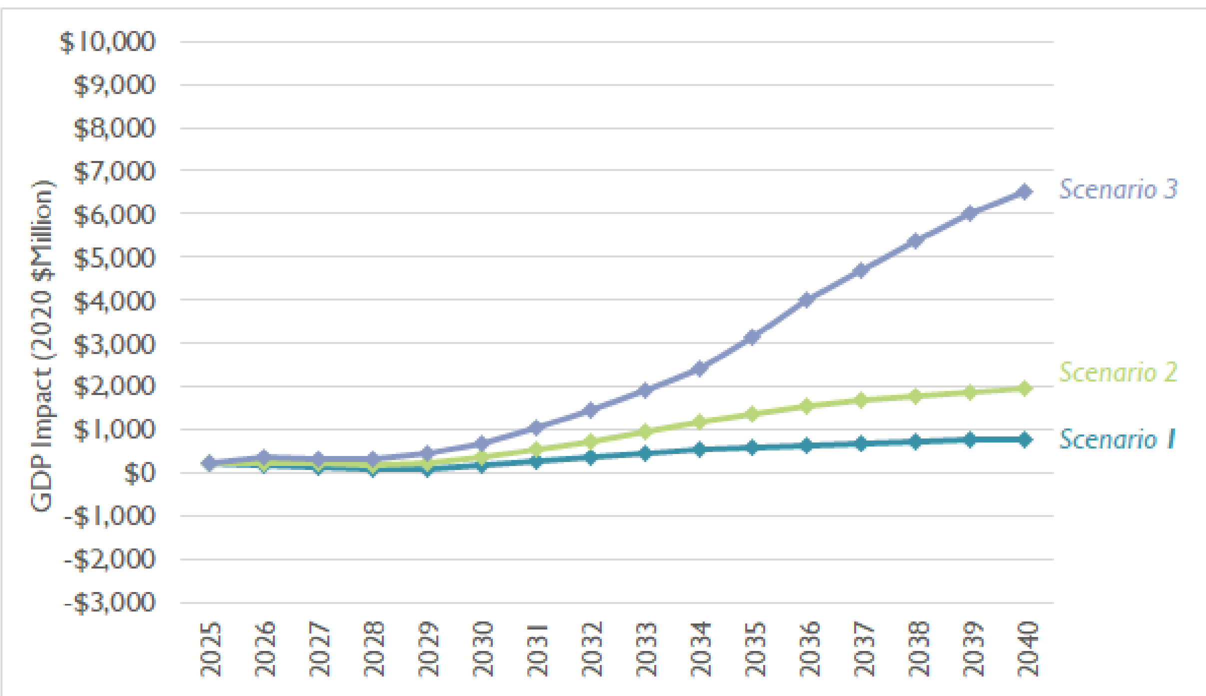


Figure 13. All Scenarios: Annual Illinois GDP impact by initial spending industry

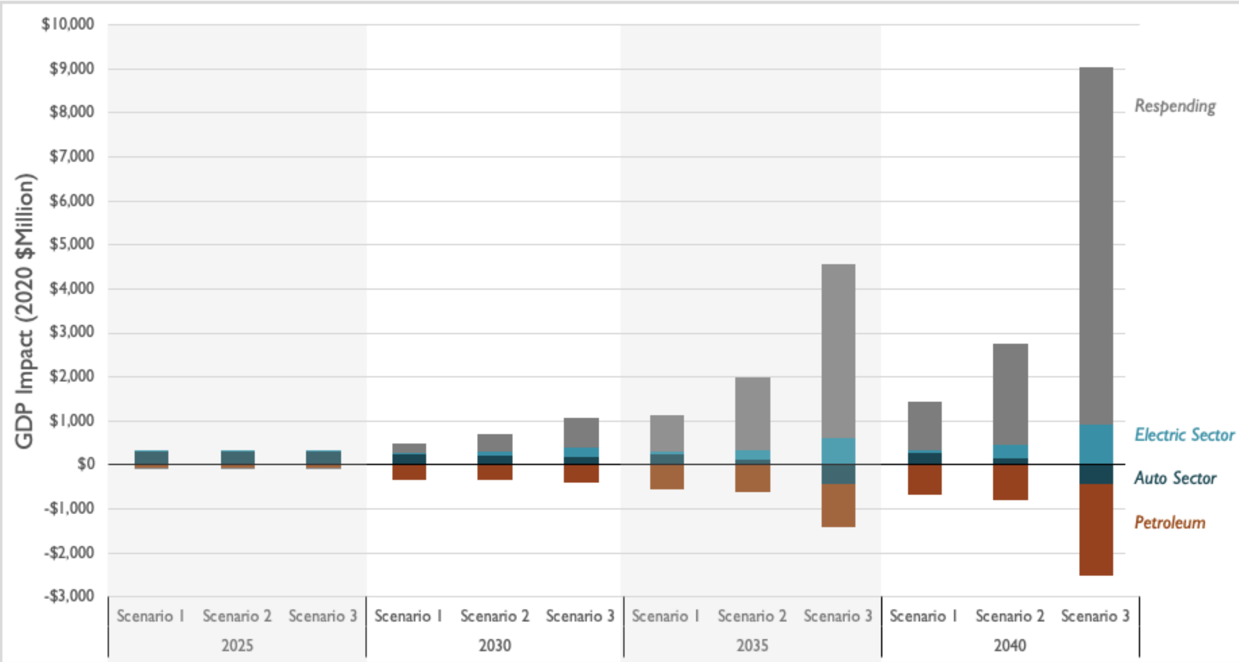


Figure 14. Policy Scenario 1: Annual Illinois GDP impacts by initial spending industry

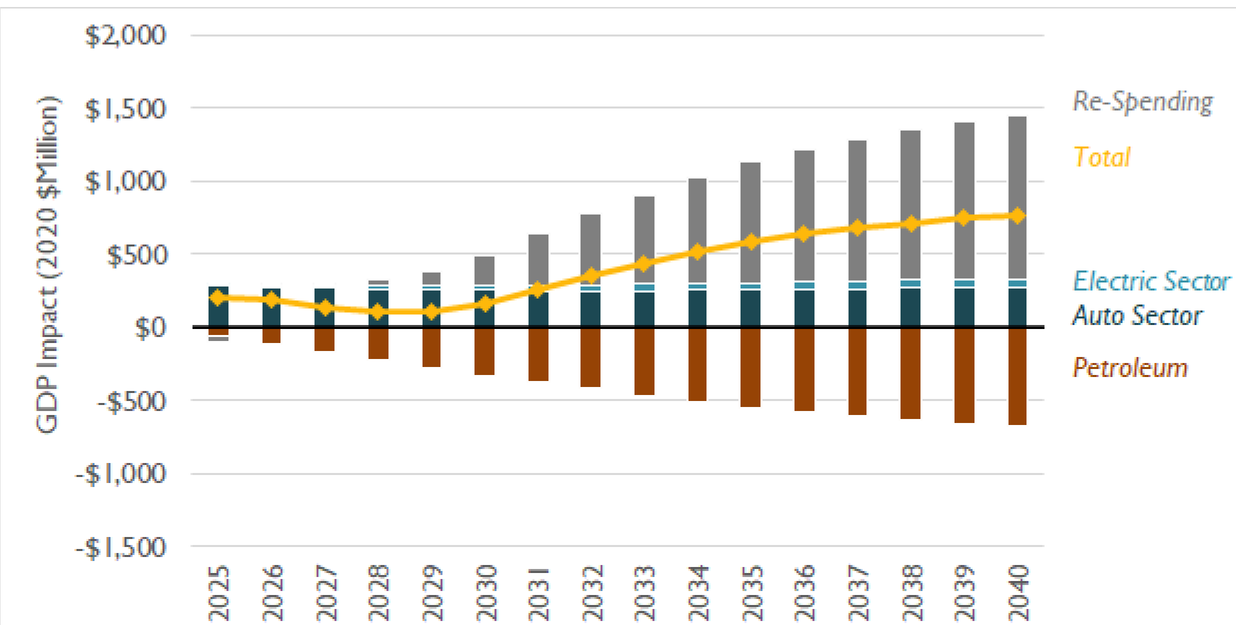


Figure 15. Policy Scenario 2: Annual Illinois GDP impacts by initial spending industry

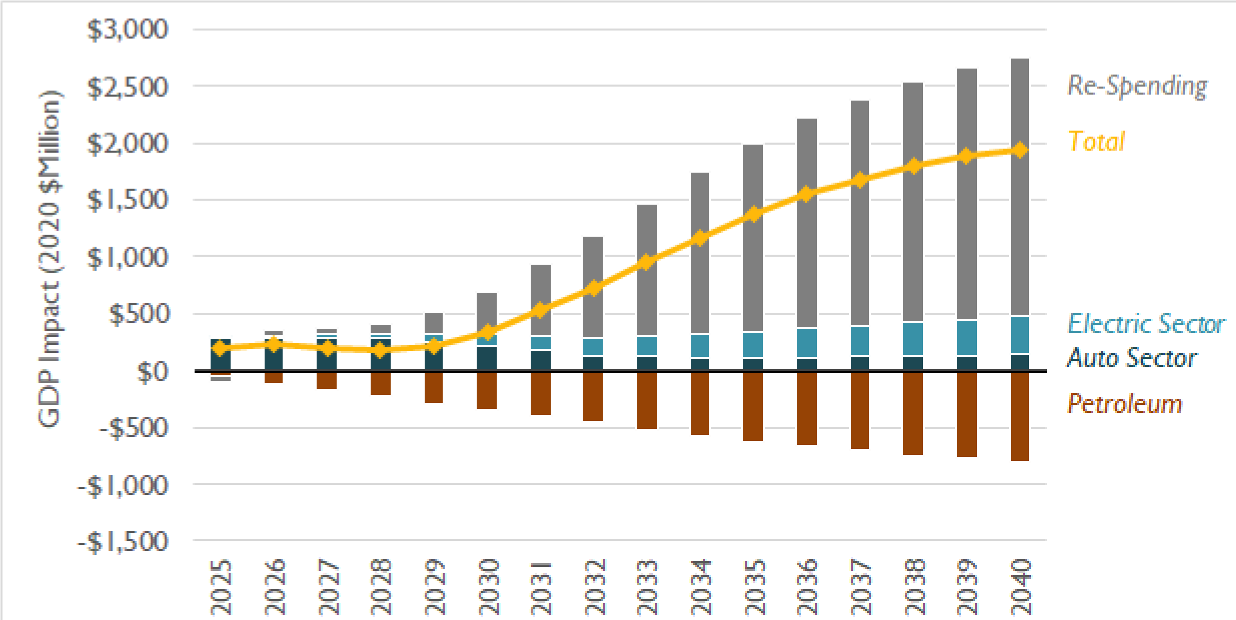
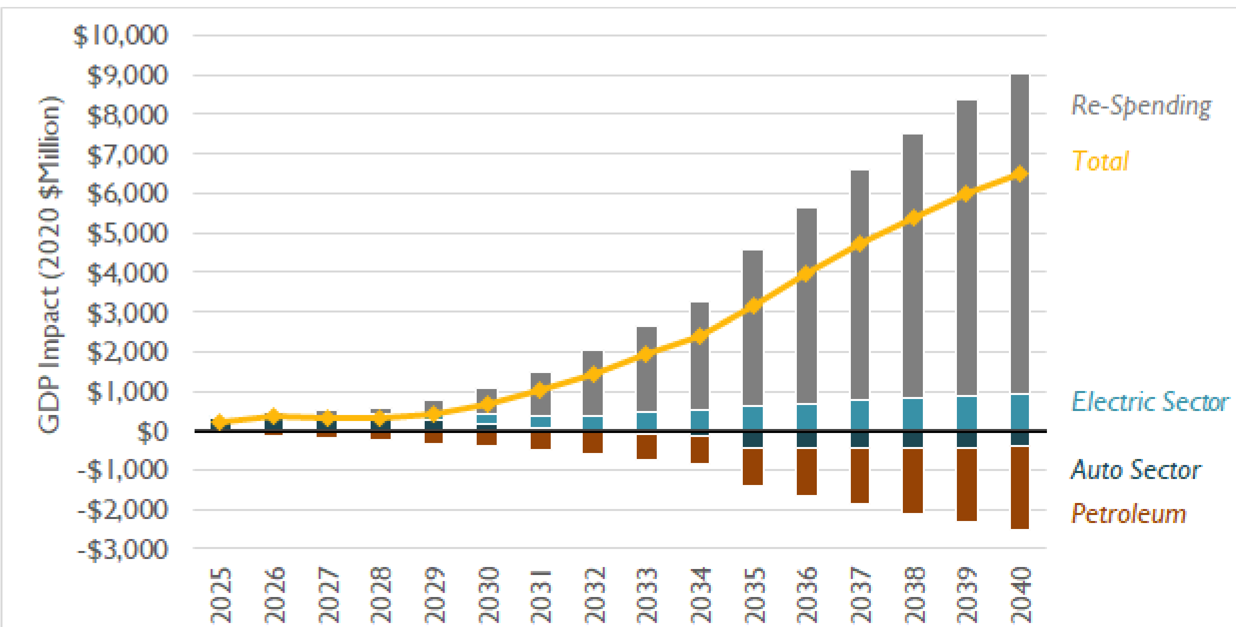


Figure 16. Policy Scenario 3: Annual Illinois GDP impacts by initial spending industry



The local purchase percentage from IMPLAN for the auto manufacturing industry in Illinois is moderate at 34.7 percent.[33] This indicates that for every dollar spent on the auto manufacturing industry in Illinois roughly one-third remains in Illinois. Therefore, clean vehicle policies should result in increased expenditures on new vehicles. Illinois is especially well suited to reap the economic benefits of such

[33] According to IMPLAN data, 34.72 percent of spending on the auto manufacturing industry in Illinois stays in Illinois.

policies given the fact it already ranks in the top 10 for the number of facilities developing clean and fuel-efficient vehicle technologies. The state has 44 such facilities with a combined 9,904 employees.[34,35]

However, as shown in Figure 16, the transition away from ICE vehicle technology by 2035 in Policy Scenario 3 creates slight negative GDP impacts related to the auto industry in Illinois. This is due to the assumption that some EVs will reach price parity with conventional ICE vehicles as early as 2024, with further price declines over time. The lower price premium of EVs compared to ICE vehicles results in a negative investment in the auto industry in later years.

Finally, we note that our modeling results are dependent on uncertain input assumptions. For example, gasoline prices may rise faster or slower than those in our gas price forecast, and EV price parity may occur sooner or later than we assume.

4. CONCLUSION

Our analysis indicates that each of the three policy scenarios is likely to result in positive macroeconomic impacts within the state of Illinois. For the study period of 2025 through 2040, Synapse estimates average net annual increases of approximately $413 million in GDP and 5,682 jobs for Policy Scenario 1; $938 million in GDP and 11,545 jobs for Policy Scenario 2; and, $2,428 million in GDP and 29,720 jobs for Policy Scenario 3. The employment and GDP benefits to Illinois increase as the ZEV penetration in each policy scenario increases. It is important to note that these findings of positive macroeconomic impacts do not account for any of the emission reduction benefits that are typically a primary goal of clean car standards. Therefore, Illinois can achieve the health and environmental benefits of vehicle emission reductions while continuing to strengthen its economy.

[34] Natural Resources Defense Council and Blue-Green Alliance. 2017.

[35] This value is close to the employment value associated with the IMPLAN 2018 dataset for the auto manufacturing industry (11,130 employees).