Comparison of Maine Adoption of ACC II Results: Through 2032 vs. 2035

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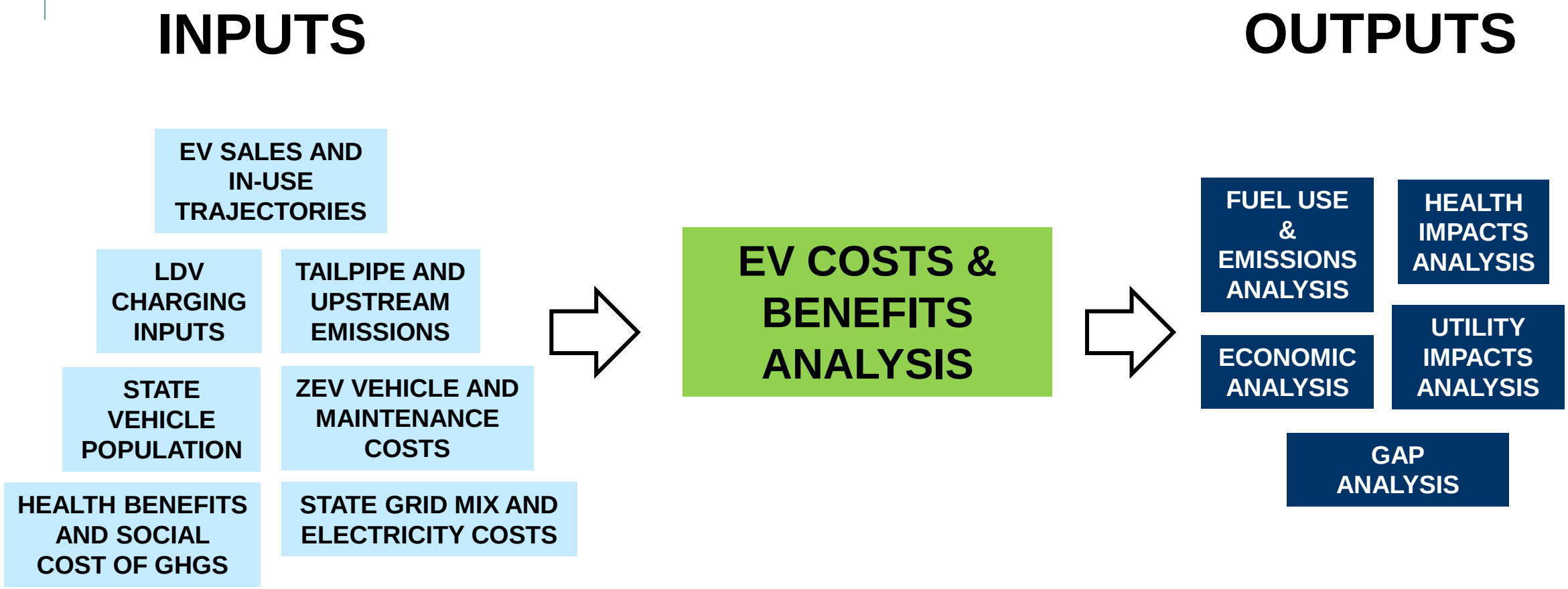
The business of sustainability

ERM

Agenda

- Modeling Framework
- Scenarios
- ZEV Vehicle Population
- Climate Benefits
- Air Quality Benefits
- Cumulative Health Benefits
- Utility Impacts
- Charging Infrastructure
- ZEV Owner Benefits
- Jobs and GDP Impacts
- Cumulative Net Societal Benefits

Modeling Framework Schematic

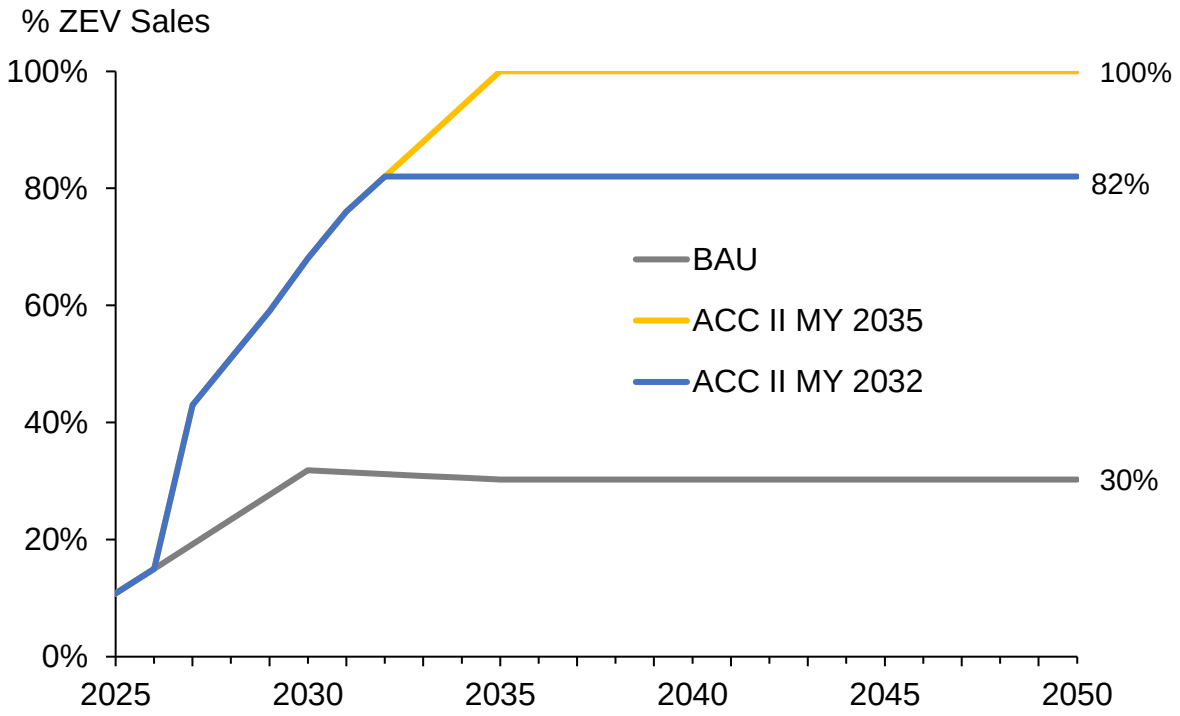


Detailed Model Outputs

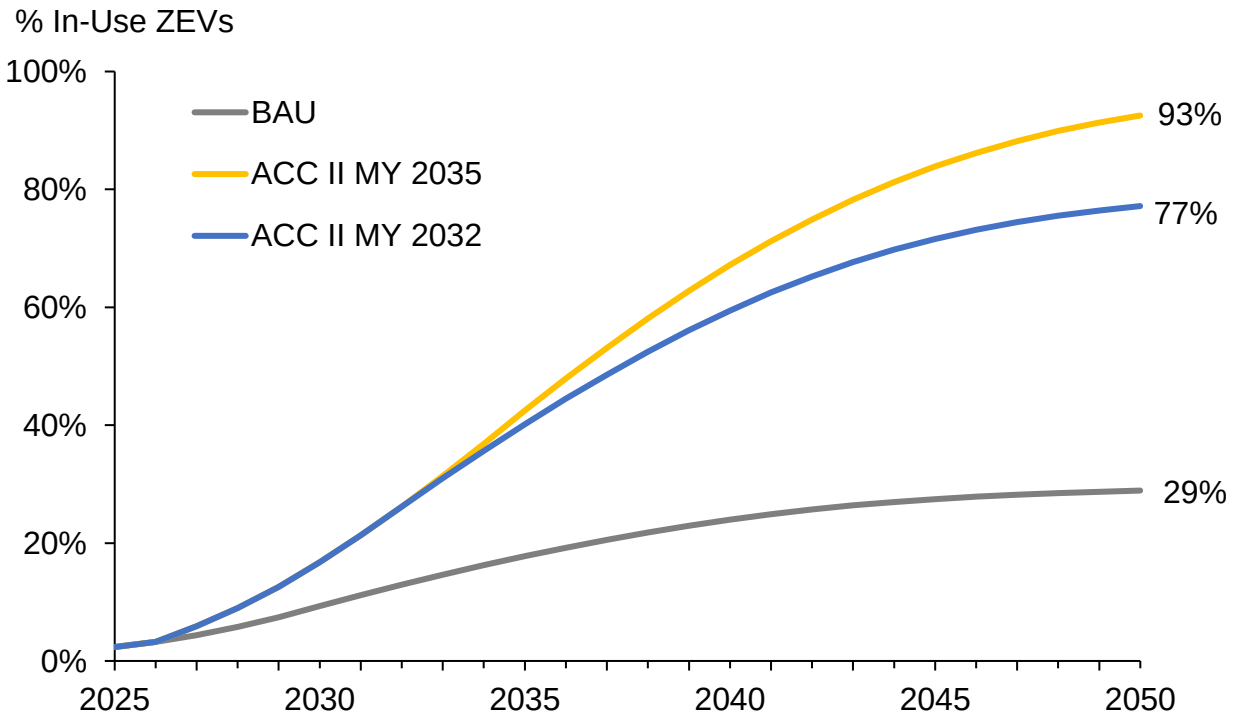
FUEL USE & EMISSIONS ANALYSIS	▪ Δ Fuel use (diesel, gasoline, electricity) ▪ Δ GHG emissions (CO_2, CH_4, N_2O) and criteria pollutants (NOx, PM2.5), including both tailpipe and upstream emissions ▪ Monetized value of net emission reductions
HEALTH IMPACTS ANALYSIS	▪ Δ Premature deaths due to lower NOx and PM emissions ▪ Δ Hospital visits & asthma incidents due to lower NOx and PM emissions ▪ Monetized value of net health benefits
ECONOMIC ANALYSIS	▪ Δ Spending on vehicle purchase, fuel, and maintenance ▪ Charging infrastructure investments ▪ Jobs and GDP Impact
UTILITY IMPACTS ANALYSIS	▪ Δ Electricity use and load ▪ Utility net revenue ▪ Impact on electricity rates
GAP ANALYSIS	▪ Estimate of state-level charging infrastructure needs

Modeled Scenarios

- **Business-As-Usual (BAU)**
  - ZEV sales grow moderately particularly driven by the IRA and current Federal standards
- **ACC II MY 2035**
  - ME adopts the full ACC II regulation requiring the state to reach 100 percent ZEV sales by MY 2035. Sales hold steady in future years.
- **ACC II MY 2032**
  - ME adopts ACC II only through MY 2032 when ZEV sales reach 82%. ZEV sales are held at 82% for future years

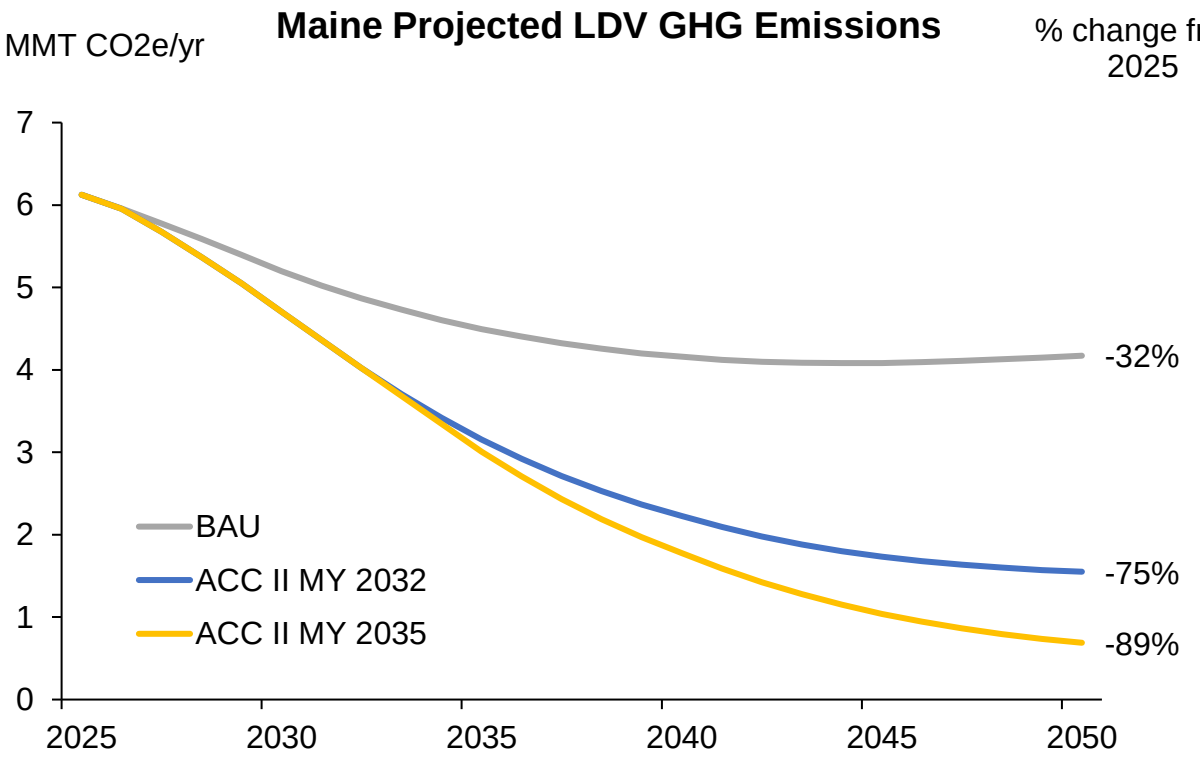


ZEV Population



- The ZEV population is derived from a fleet turnover model that incorporates vehicle survival rates as well as projected growth
- The ACC II MY 2035 scenario results in a significantly higher population of ZEVs by 2050 compared with a scenario held at 82% sales
- This represents a gap of about **230,000 vehicles** (roughly **15%** of the projected 2050 vehicle fleet)

Climate Benefits

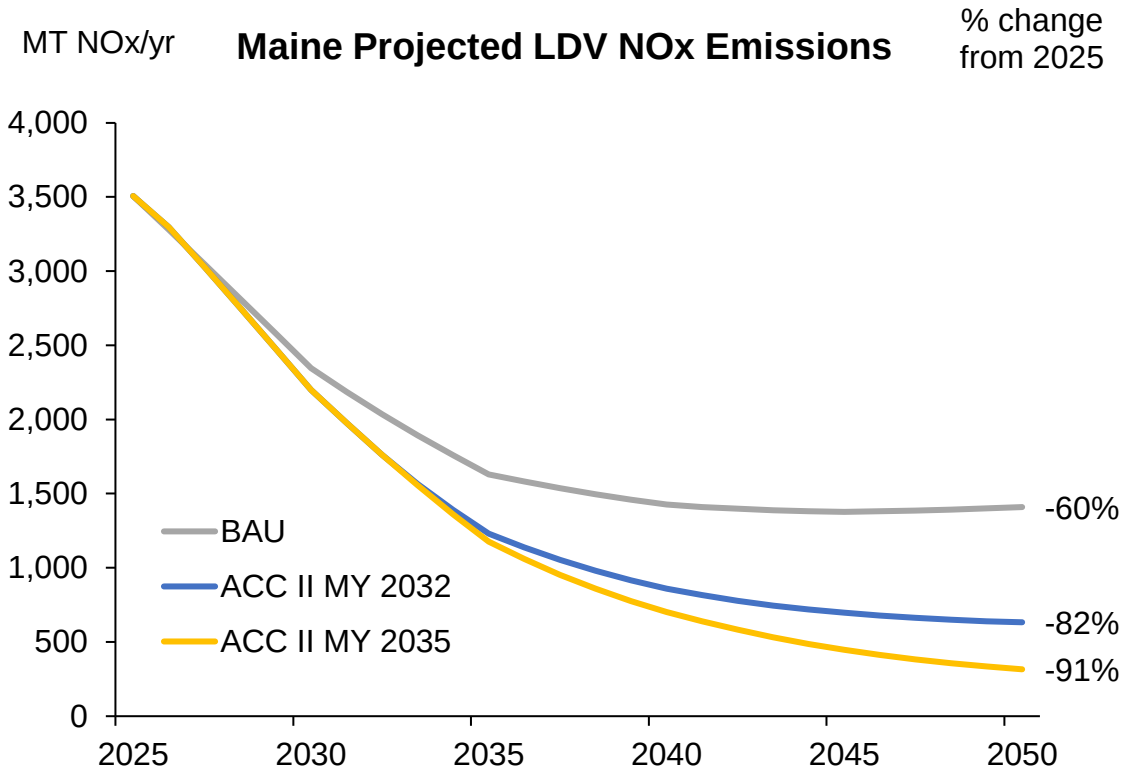


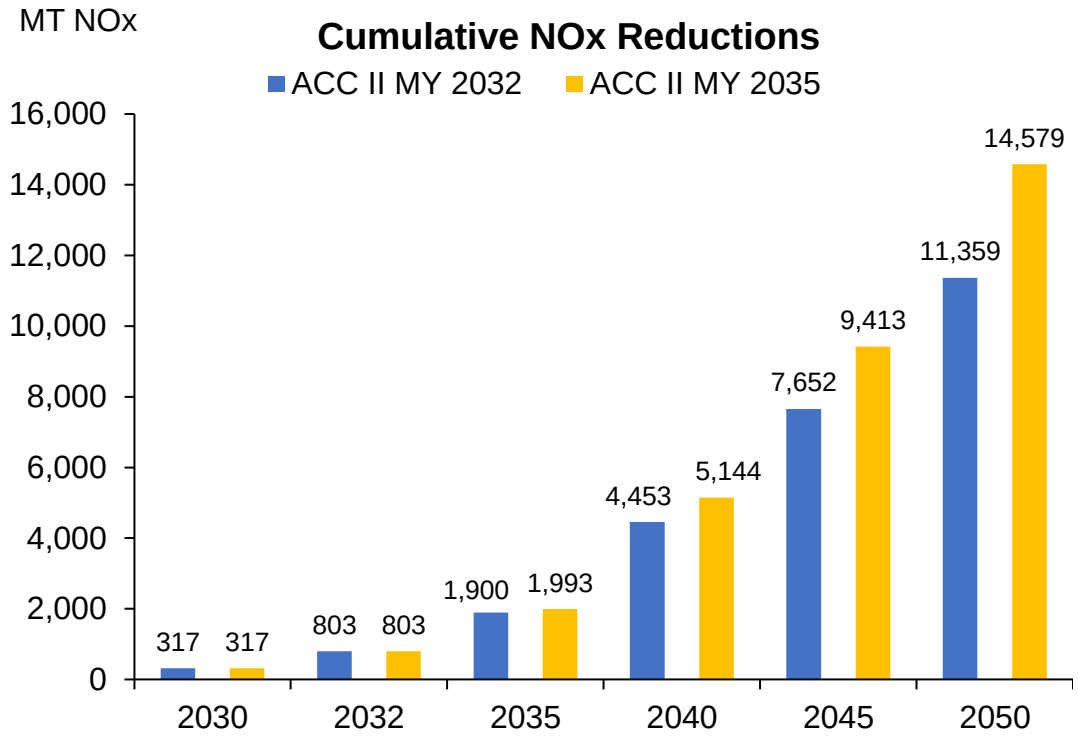
- As the ZEV population grows and part of the LDV fleet turns over to more efficient ICE vehicles, annual CO2e emissions are cut by **~ 89%** in 2050 compared to 2025 in the ACC II MY 2035 Scenario, versus by about **~75%** in the ACC II MY 2032 Scenario.
- In the ACC II MY 2035 Scenario, cumulative reductions reach close to **50 million MT of CO2e** (2027 through 2050) providing a benefit of **$3.9 billion** by 2050, as compared with **40 million MT of CO2e** and **$3.2 billion** for the ACC II MY 2032 Scenario.
- Climate benefits were monetized using IPCC's Social Cost of GHGs

Note: Maine does not have estimates of total LDV GHG emissions in 1990 for percent change comparison to 2050 projections. ERM estimated these emissions to be 6.8 MMT CO2e, based on 1990 transportation sector CO2 emissions from fuel combustion from Maine DEP GHG Report https://www.maine.gov/dep/news/news.html?id=1988154, assuming 62% of these emissions are from LDVs based on 1990 data from EPA U.S. GHG Inventory as proxy for Maine https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf. Resulting estimate of 1990 LDV CO2 emissions from fuel combustion increased to total CO2e based on ERM analysis, informed by tailpipe and upstream emissions factors from GREET used in projection analysis. GHG emission reductions achieved by 2050 compared to 1990 amount to 39%, 77% and 90% for BAU, ACC II MY 2032 and ACC II MY 2035 scenarios respectively.

For simplicity and consistency with federal projections, ERM's "clean electricity generation" mix includes biomass, although ERM recognizes there are emissions associated with this category of fuel sources. Biomass is projected to comprise less than 1% of the fuel mix and the impacts of this inclusion are therefore nominal.

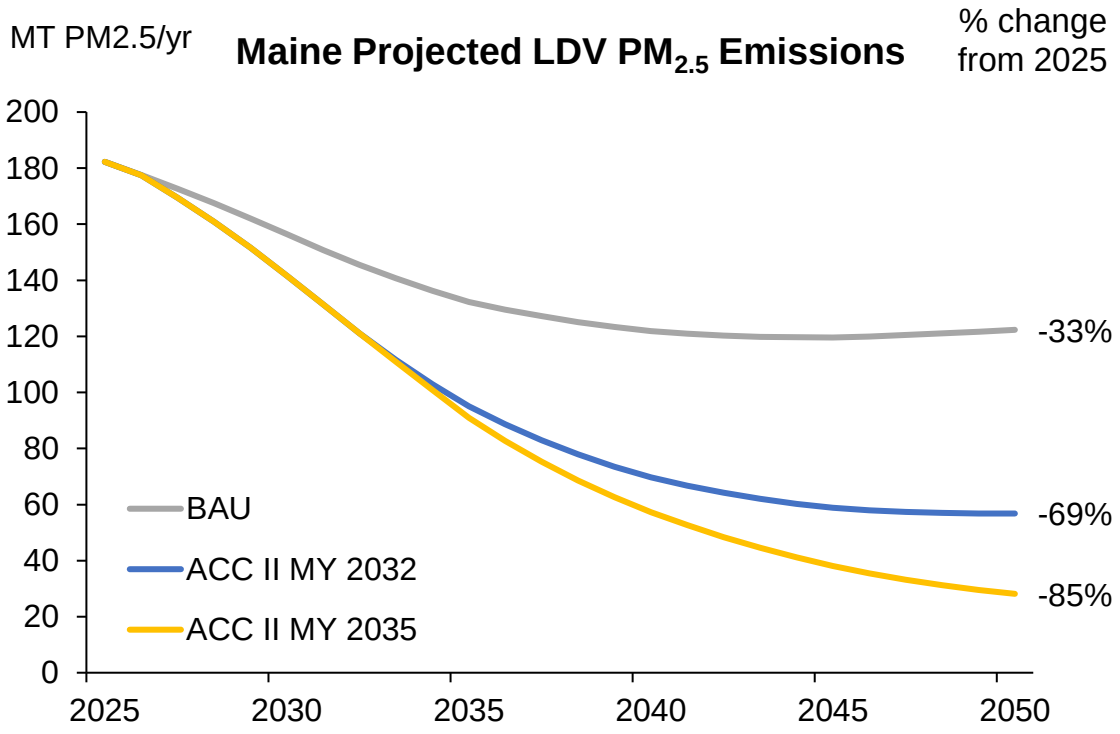
Air Quality Benefits – NOx Emissions

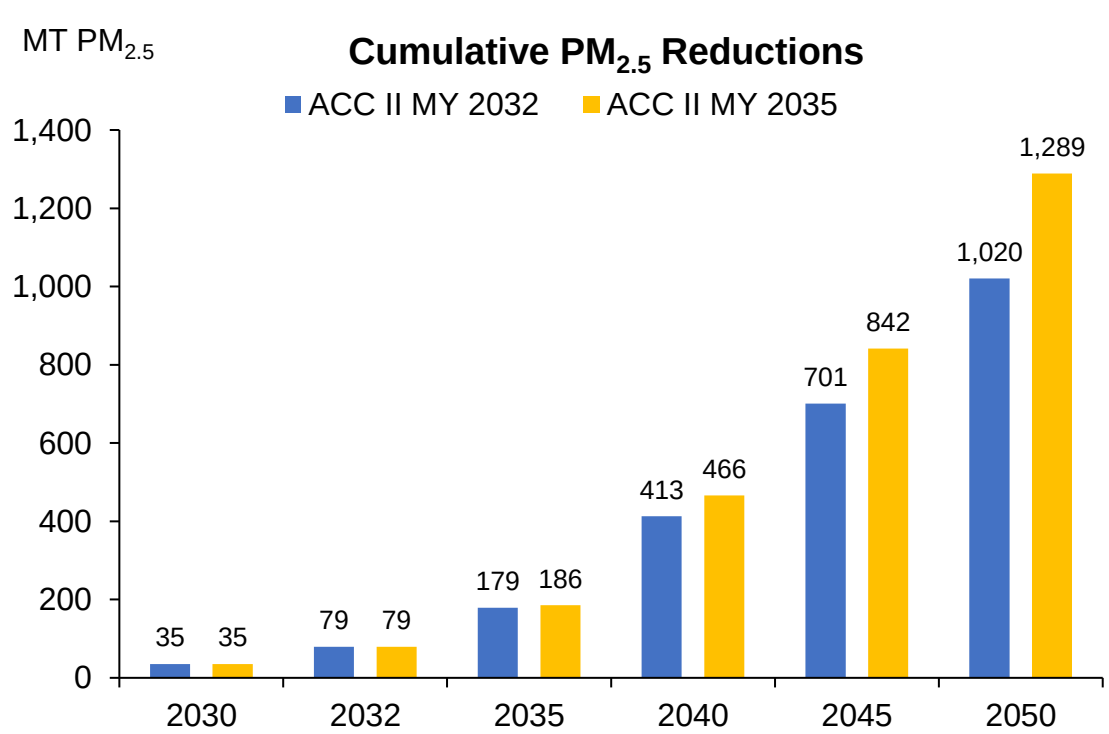




The ACC II MY 2035 Scenario results in **91% reduction of NO_X emissions** by 2050 with a cumulative reduction of almost **14,600 MT** between 2027 and 2050; whereas the ACC II MY 2032 Scenario results in an **82% reduction** by 2050 and nearly **11,400 MT** in cumulative reductions

Air Quality Benefits – PM2.5 Emissions





The ACC II MY 2035 Scenario results in **85% reduction of $PM_{2.5}$ emissions** by 2050 with a cumulative reduction of almost **1,300 MT** between 2027 and 2050; whereas the ACC II MY 2032 Scenario results in a **69% reduction** by 2050 and just over **1,000 MT** in cumulative reductions

Cumulative Health Benefits

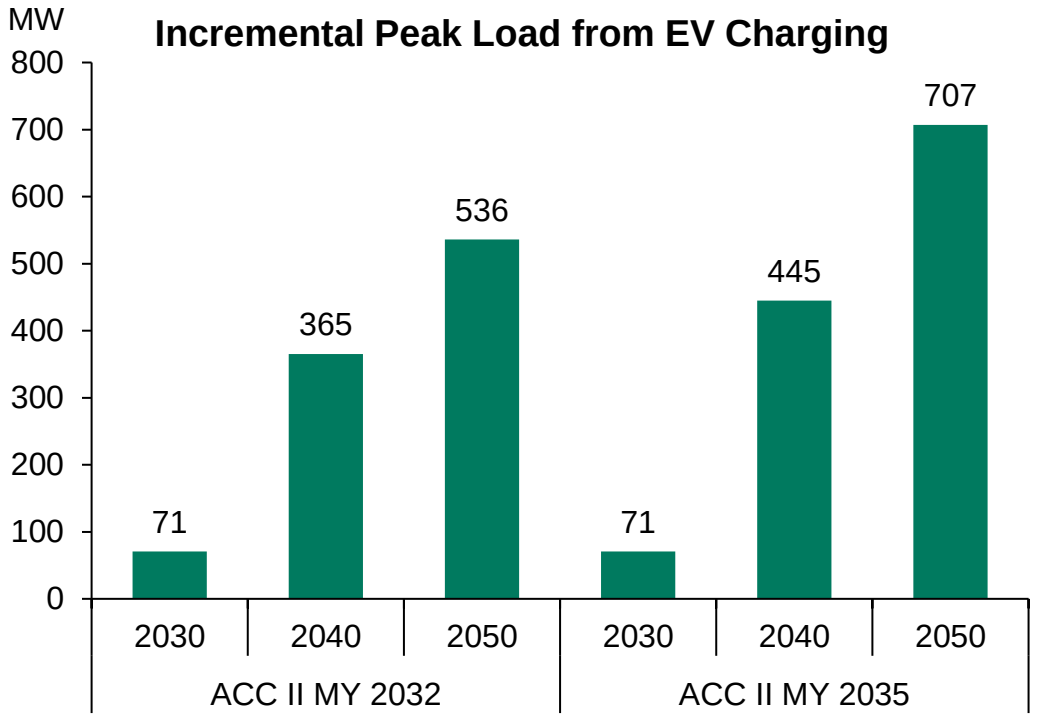
- Reducing criteria pollutant emissions improves air quality and leads to health outcome improvements.
- To convert emission reductions into health benefits, EPA's COBRA model was used.

	Cumulative Reduction by 2050 (MT)		Cumulative Reduced Incidents			Monetized Value (2021$ mill)
	NOx	$PM_{2.5}$	Mortality	Hospital	Minor*	
ACC II MY 2032	11,359	1,020	36	33	20,056	$438
ACC II MY 2035	14,579	1,289	45	42	24,945	$546

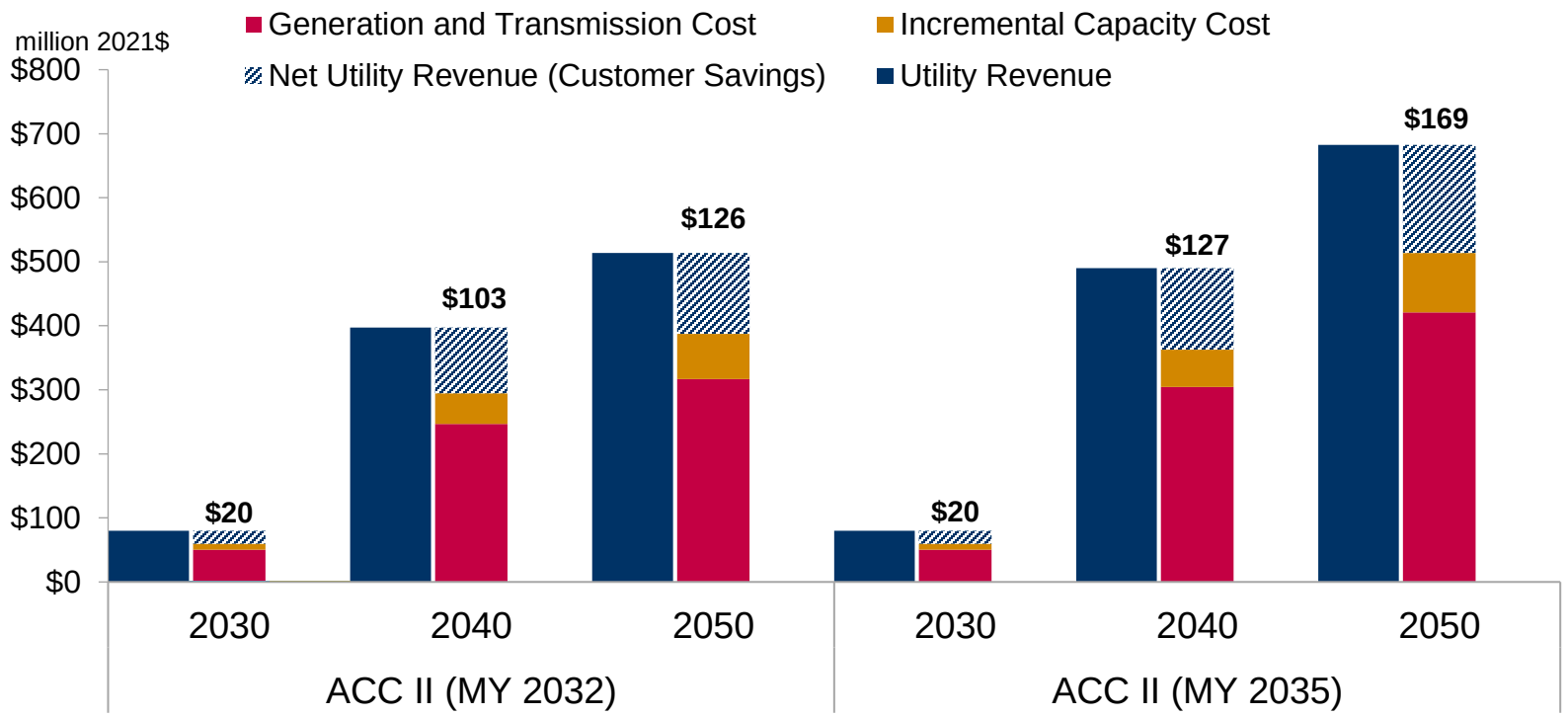
* *Minor health incidents include cases of acute bronchitis and other respiratory symptoms (not resulting in hospitalizations), restricted activity days and lost workdays*

Utility Impacts

- This analysis assumes widespread managed home charging, shifting 70% to off peak hours. This allows ME utilities to minimize grid infrastructure upgrades
- By increasing the efficiency of the grid, and increasing revenue in excess of utility costs, LDV electrification in ME has the potential to reduce electric customer rates.
- LDV electrification drives up utility revenue at the same time it drives up utility costs (e.g. for generation and transmission and incremental capacity). The increased utility revenue exceeds increased costs in both scenarios for every year, resulting in customer savings.



Utility Impacts Continued

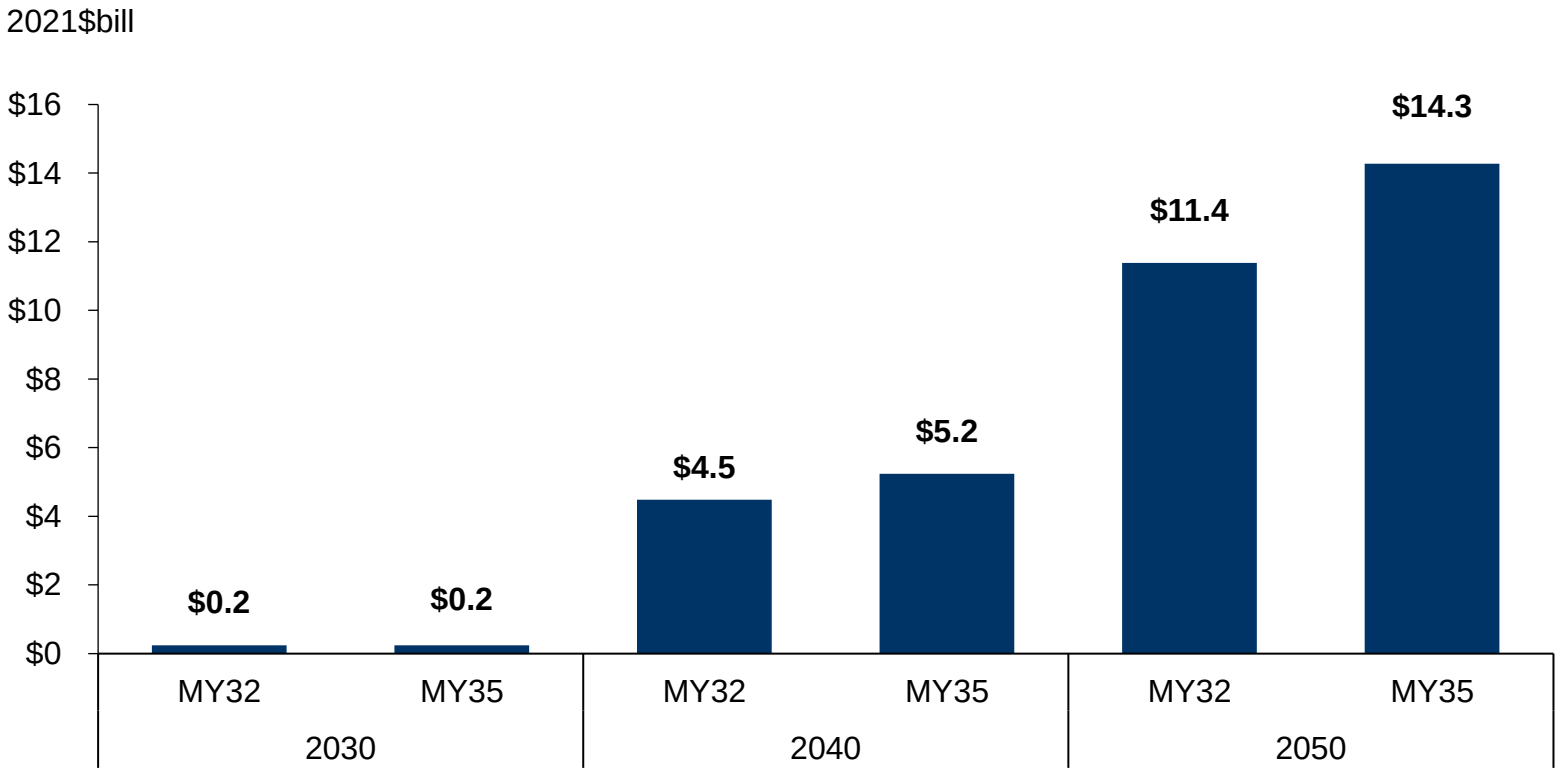


Under the ACC II MY 2032 scenario, annual customer savings are projected to be **$20 million in 2030, rising to $103 million in 2040 and reaching $126 million in 2050**.

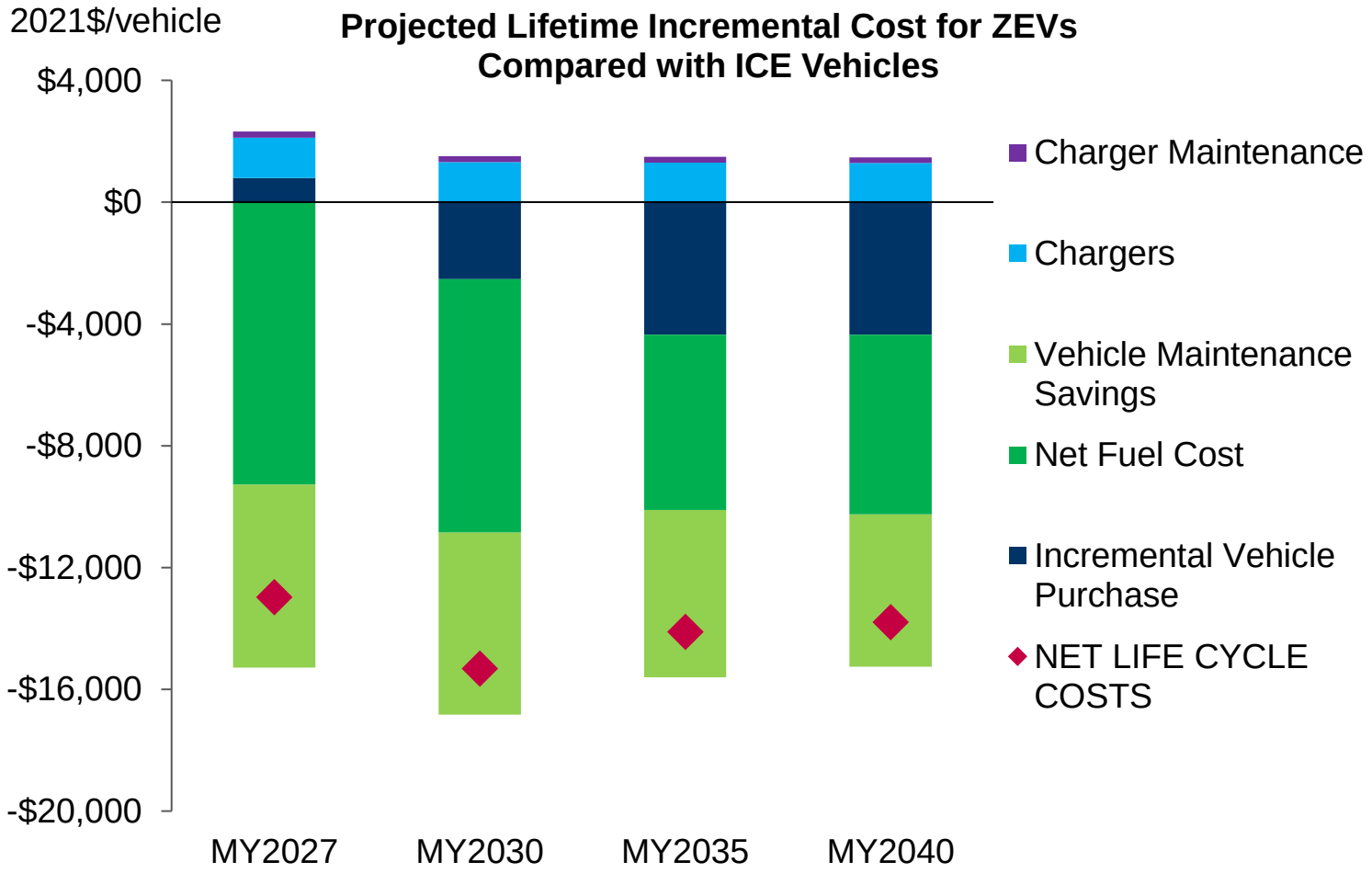
Under the ACC II MY 2035 scenario, annual customer savings are projected to be **$20 million in 2030, rising to $127 million in 2040 and reaching $169 million in 2050.**

ZEV Owner Benefits

- ZEV owner benefits are the net difference of positive costs (incremental cost of purchasing a ZEV, cost of purchasing chargers and their maintenance) and owner savings (fuel and maintenance savings of owning a ZEV)
- ACC II MY2035 scenario results in more than **25%** higher cumulative owner benefits by 2050 compared with an ACC II MY2032 scenario

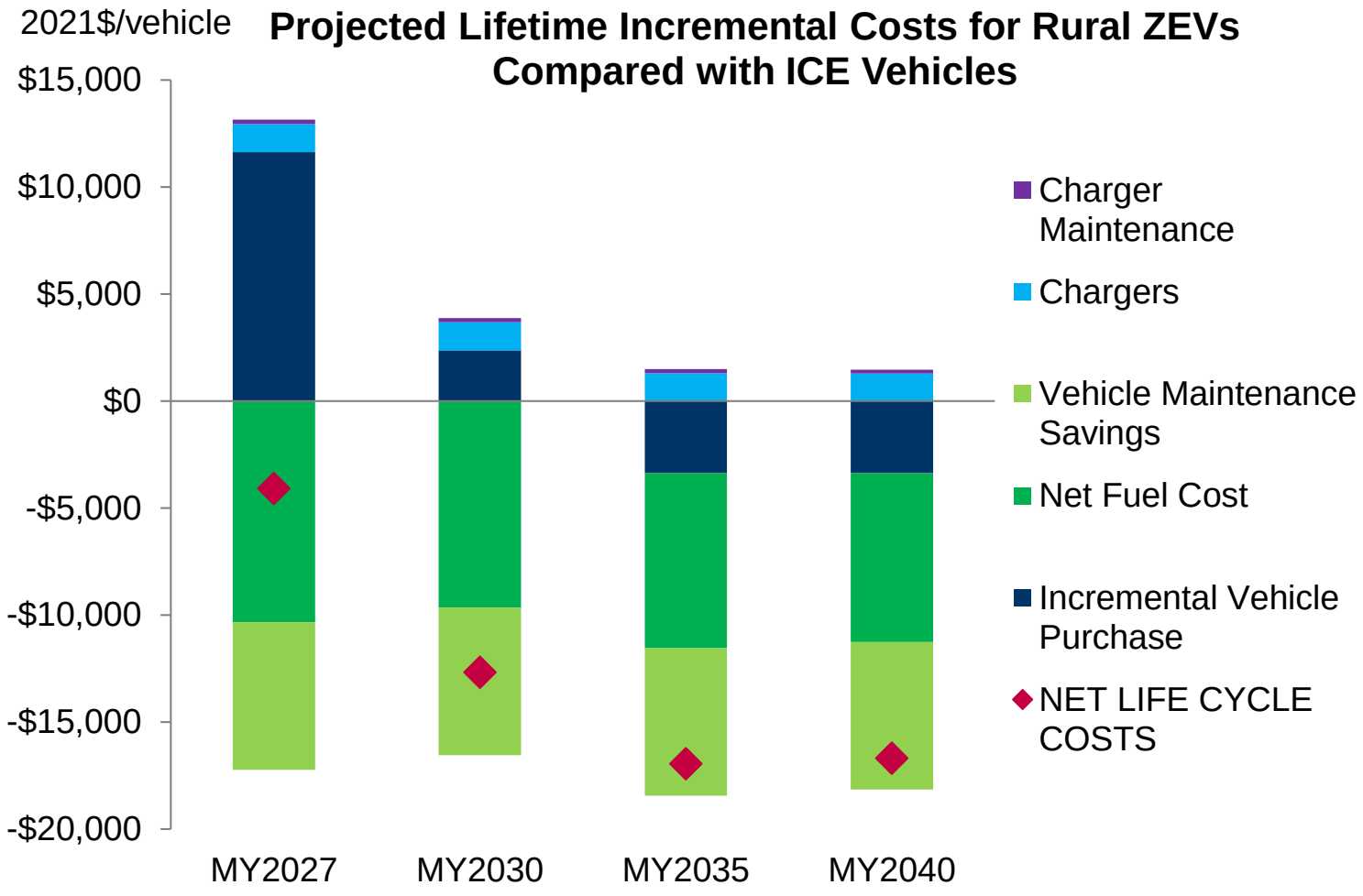


Average ZEV Owner Net Lifecycle Costs



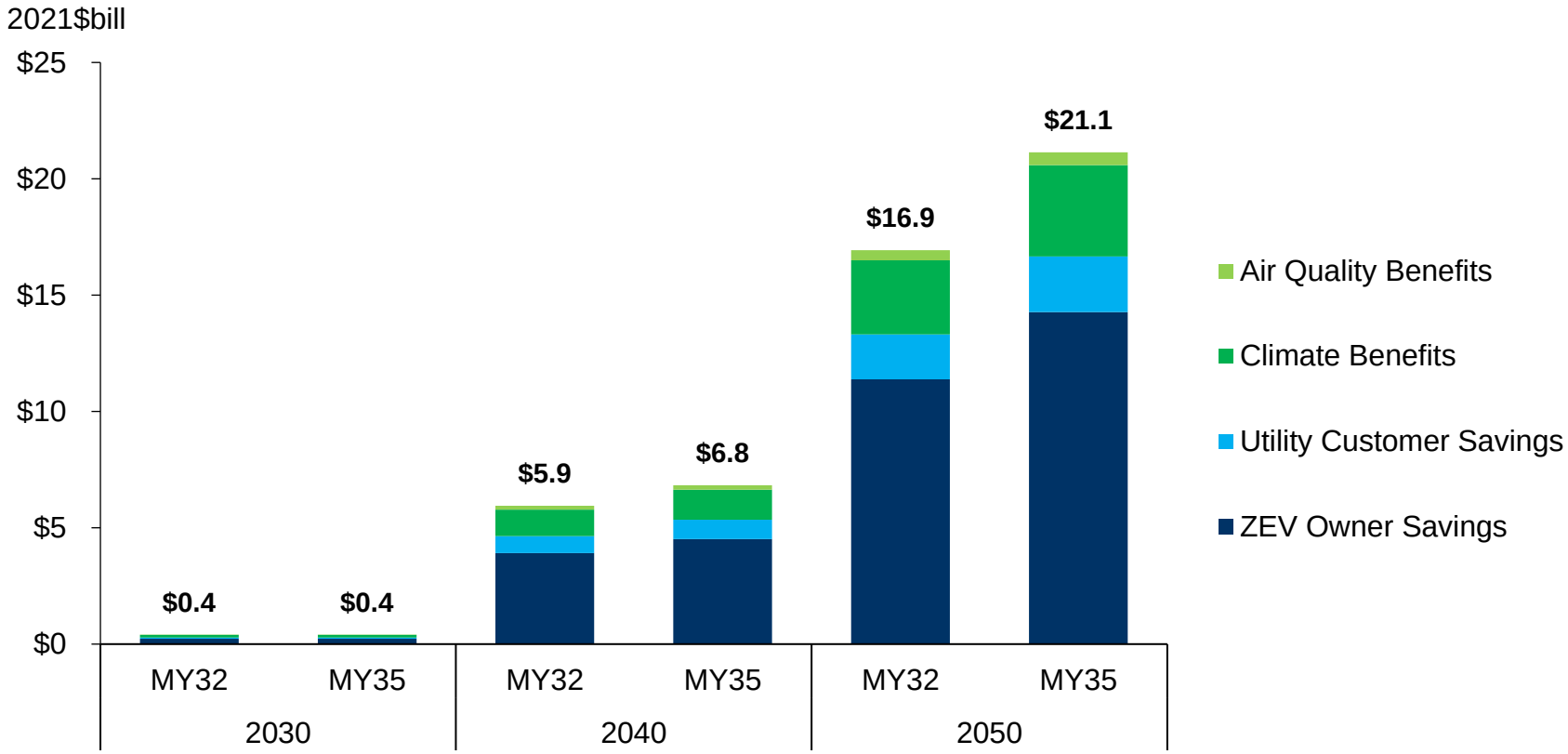
- By MY2030, ZEV owners save more than $15,000 in lifetime costs as compared to a conventional vehicle.
- Even with MY2027 vehicles when ZEV purchase prices are higher, the decrease in fuel and maintenance costs mean lifetime savings for the vehicle owner.
- Assumed 16-year lifetime and 3% discount rate.
- Using a 7% discount rate still results in substantial savings.

Average ZEV Owner Net Lifecycle Costs – Rural Owners



- After MY2030, savings to more than $12,000 due to the incremental purchase cost of the ZEV becoming less expensive than a comparable ICE vehicle.
- Even with MY2027 vehicles when ZEV purchase prices are higher, the decrease in fuel and maintenance costs mean lifetime savings for the vehicle owner.
- Assumed 16-year lifetime and 3% discount rate.
- Using a 7% discount rate still results in substantial savings.

Cumulative Net Societal Benefits



Between 2027 and 2050, cumulative net societal benefits reach **$21.1 billion for the ACC II MY 2035 Scenario; $4.2 billion more than the ACC II MY 2032 Scenario.**

Jobs and GDP Impacts

METRIC		ACC II MY 2032			ACC II MY 2035		
		2030	2040	2050	2030	2040	2050
Net Change in Jobs		3,104	978	922	3,104	1,404	974
Net Change in GDP (2021$ Millions)		$520	$310	$340	$520	$410	$430
Average Annual Compensation	Added Jobs	$103,326	$95,135	$93,690	$103,326	$95,298	$94,367
	Replaced Jobs	$66,172	$61,482	$60,873	$66,172	$61,796	$60,755

Benchmarking ERM analysis to other studies

ERM compared this work to several other studies, and the message is clear:
Full adoption of zero emission vehicle regulations (ACC II) through 2035 provides significant benefits to the climate, local air quality and state economy

ERM comparison to **Energy Innovation's** Energy Policy Simulator (EPS) and **ICCT's** Emission Summary fact sheet results for Maine finds parallels across all three studies:

- GHG emissions reductions range from **66% to 89%** from 2025 levels by 2050*
- Health benefits, such as **42 to 49 less** hospital visits and/or asthma attacks
- Cumulative ZEV owner savings of **$10.5 to $14.3 billion**
- Greater than **500 million gallons** of petroleum fuel use reduced through 2050*

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** ICCT's fact sheet provides benefits through 2040*

Note: Modeling platforms, such as the ones analyzed as part of this benchmarking, are optimized to produce scenario results based on a set of assumptions. ERM did not perform a review of all these assumptions and focused the comparison on modeling outputs and findings associated with potential implementation of ACC II policy.

Thank you

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