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

August 17, 2023
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

**INPUTS**
- EV sales and in-use trajectories
- LDV charging inputs
- State vehicle population
- Health benefits and social cost of GHGs
- Tailpipe and upstream emissions
- ZEV vehicle and maintenance costs
- State grid mix and electricity costs

**OUTPUTS**
- EV costs & benefits analysis
- Fuel use & emissions analysis
- Health impacts analysis
- Economic analysis
- Utility impacts analysis
- Gap analysis
## Detailed Model Outputs

### FUEL USE & EMISSIONS ANALYSIS
- △ Fuel use (diesel, gasoline, electricity)
- △ 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
- △ Premature deaths due to lower NOx and PM emissions
- △ Hospital visits & asthma incidents due to lower NOx and PM emissions
- Monetized value of net health benefits

### ECONOMIC ANALYSIS
- △ Spending on vehicle purchase, fuel, and maintenance
- Charging infrastructure investments
- Jobs and GDP Impact

### UTILITY IMPACTS ANALYSIS
- △ 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.
• 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.
The ACC II MY 2035 Scenario results in a 91% reduction of NO\textsubscript{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.
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.

<table>
<thead>
<tr>
<th>Cumulative Reduction by 2050 (MT)</th>
<th>Cumulative Reduced Incidents</th>
<th>Monetized Value (2021$ mill)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>PM$_{2.5}$</td>
<td>Mortality Hospital Minor*</td>
</tr>
<tr>
<td>ACC II MY 2032</td>
<td>11,359</td>
<td>1,020</td>
</tr>
<tr>
<td>ACC II MY 2035</td>
<td>14,579</td>
<td>1,289</td>
</tr>
</tbody>
</table>

*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.
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
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.
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

<table>
<thead>
<tr>
<th>METRIC</th>
<th>ACC II MY 2032</th>
<th>ACC II MY 2035</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2030</td>
<td>2040</td>
</tr>
<tr>
<td>Net Change in Jobs</td>
<td>3,104</td>
<td>978</td>
</tr>
<tr>
<td>Net Change in GDP (2021$ Millions)</td>
<td>$520</td>
<td>$310</td>
</tr>
<tr>
<td>Average Annual Compensation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added Jobs</td>
<td>$103,326</td>
<td>$95,135</td>
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<tr>
<td>Replaced Jobs</td>
<td>$66,172</td>
<td>$61,482</td>
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</table>
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*

* 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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