Final Report Out – Accelerating Light Duty Zero Emission Vehicle Adoption in Maryland

Assistance for the Greenhouse Gas Mitigation Working Group of the Maryland Commission on Climate Change

Project funded by: The Nature Conservancy, Maryland/DC Chapter

March 16, 2023

Project Overview

- **Project objective**
  - Evaluate the current status of Maryland's light-duty vehicle (LDV) ZEV and charging infrastructure plans, programs, and other efforts → **Determine if they are sufficient to meet the State's goal of reducing greenhouse gas (GHG) emissions by at least 60% by 2031**
  - Evaluate the effectiveness of existing Maryland programs to determine if: 1) they **can be improved** and 2) **whether they should continue**
  - Identify/**develop potential policy frameworks for improved/new programs** to increase adoption to meet/exceed the State's goals
- **Technical tasks**
  - **Task 1** – Reference Case Analysis – Understand the current conditions, drivers, potential barriers, and developed projections.
  - **Task 2** – Recommendations for State Action – Determine potential programs to introduce in Maryland. Evaluate cost and impact of current/potential programs.
  - **Task 3** – Recommendations for Equitable ZEV Charging Solutions – Expansion of Task 2 with focus on options to best support underserved populations
  - **Task 4** – Facilitated Subgroup Meetings – Facilitated discussion with key project stakeholders. Present findings, discuss questions, request guidance/insights

Projections – Calculation Tool

- A calculation tool, based on the 2030 GGRA Plan, was developed to evaluate ZEV adoption scenarios
- The tool output estimates (for each scenario and year) the ZEV sales (LDA, LDT), ZEV stock (LDA, LDT), GHG and NOx avoided (from reduced gasoline use), GHG emissions from electricity to charge ZEVs, net GHG avoided, number of vehicles that will likely rely on public charging, and the number of public charging station ports (AC Level 2 and DCFC)

Scenarios

Seven scenarios were evaluated

- **1A – Reference** – Business as usual, from the 2030 GGRA Plan that used real data through 2017, as-is
- **1A – Reference** – Reference Scenario 1A, updated with 2018-2022 sales numbers (lower than projected).
- **2 – 2030 GGRA Plan** – 2030 GGRA Plan scenario, as-is
- **3 – MWG** – MCCC GHG MWG scenario, as-is
- **4 – ACC II – all BEV** – Uses historical Reference 1B values through 2022, ACC II sales values from 2026+. 2023-2025 sales smoothed to avoid a step change. 100% BEV sales 2026+. Apply ZEV sales percentages equally to LDA and LDT.
- **5 – ACC II – 80% BEV + 20% PHEV** – Same as Scenario 4, except 80% BEV/20% PHEV sales 2026+. Number of ZEVs is the same as Scenario 4; fleet makeup is different
- **6 – ACC II – 80% BEV + 20% PHEV with 10% higher ZEV adoption** – Same as Scenario 5, except 80% BEV/20% PHEV sales 2026+ at 10% higher adoption

The minimum required ZEV sales during the ACC II timeframe (2026-2035+) are summarized in the table below

Scenario	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
4	35%	43%	51%	59%	68%	76%	82%	88%	94%	**100%**
5	35%	43%	51%	59%	68%	76%	82%	88%	94%	**100%**
6	39%	47%	56%	65%	75%	84%	90%	97%	**100%**	**100%**

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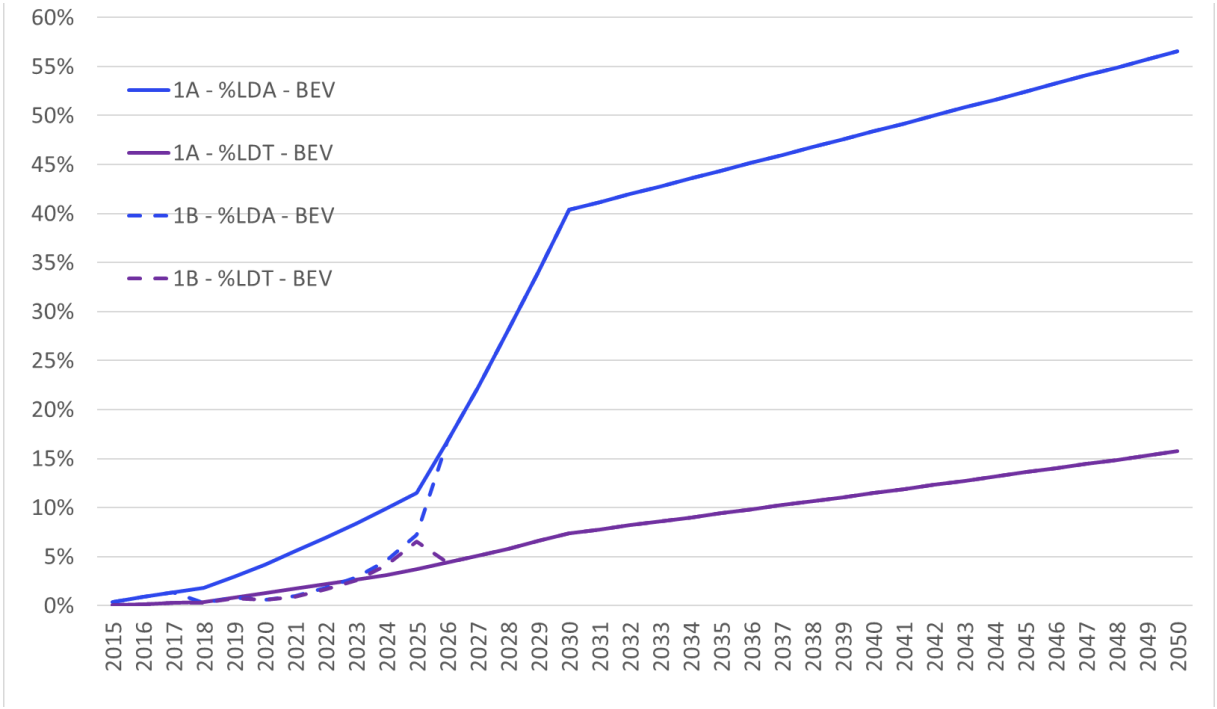
Results – Annual ZEV Sales – Reference Case Update

Reference case (1A) updated (1B) with known (lower than projected) 2018-2022 ZEV sales.

ZEV sales projections smoothed between 2022-2026 (when ACC II starts) using the 2019-2022 average annual ZEV sales increase to achieve a more realistic and smoothed increase.

The figure shows the differences between the original reference case (1A; solid lines) and the updated Scenario 1B (dotted lines).

Ultimately, the low (relatively) total number of vehicles in these early years does not have a large impact on the long-term results between Scenarios 1A and 1B.



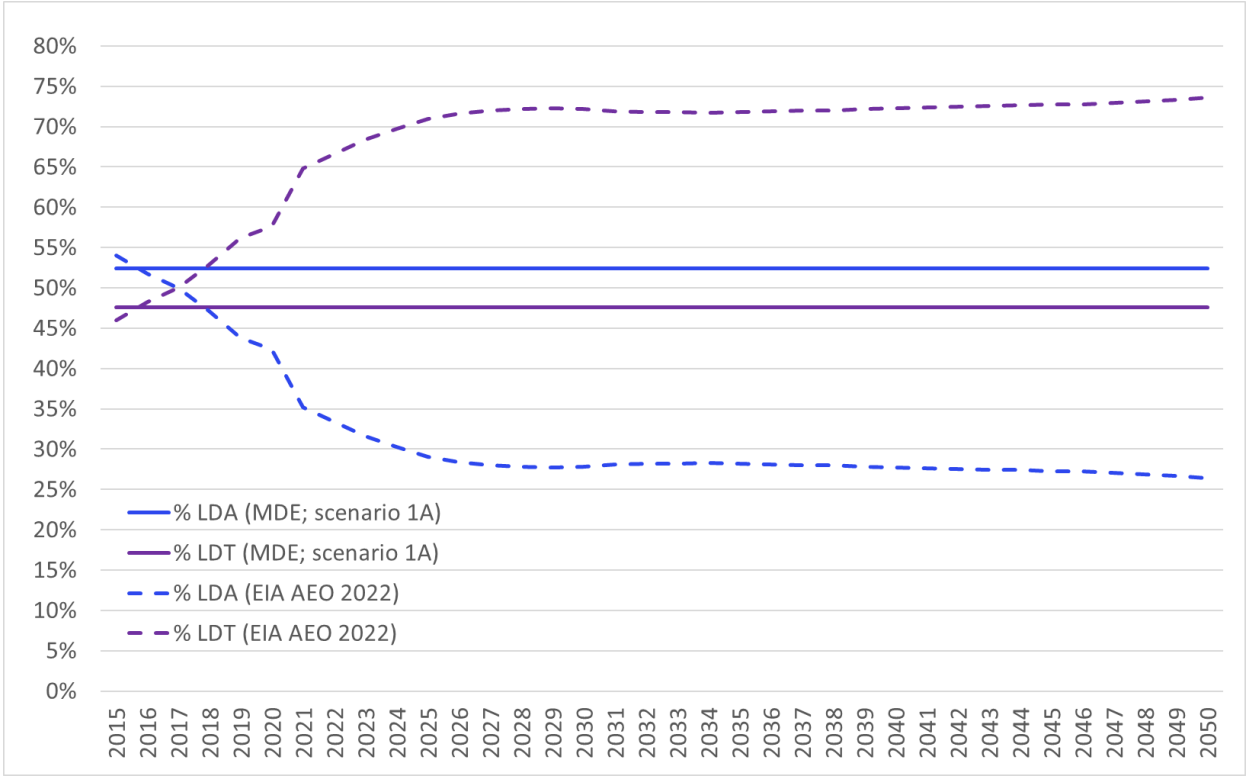
Annual sales percentages (car vs. truck) for MDE vs. EIA 2022 AEO

Results – Annual ZEV Sales – MDE vs. EIA car vs. truck

The 2030 GGRA Plan used a static vehicle type (car [LDA] vs. truck [LDT]) annual sales split (solid lines in figure).

EIA 2022 AEO values (dotted lines in figure) are much different, dynamic, and realistic given the steady shift to CUVs, SUVs, and pickup trucks that has happened since 2017 (the last year of known data for the MDE 2030 GGRA Plan).

The Reference Scenario and the 2030 GGRA Scenario assumed a much higher percentage sales of cars vs. trucks. (Includes all vehicles classified as a car; likely compact/subcompact CUVs). This affects the sales mix, but also the total fleetwide annual incremental cost of ZEVs vs. conventional vehicles and the fleet energy usage (gasoline and electricity).

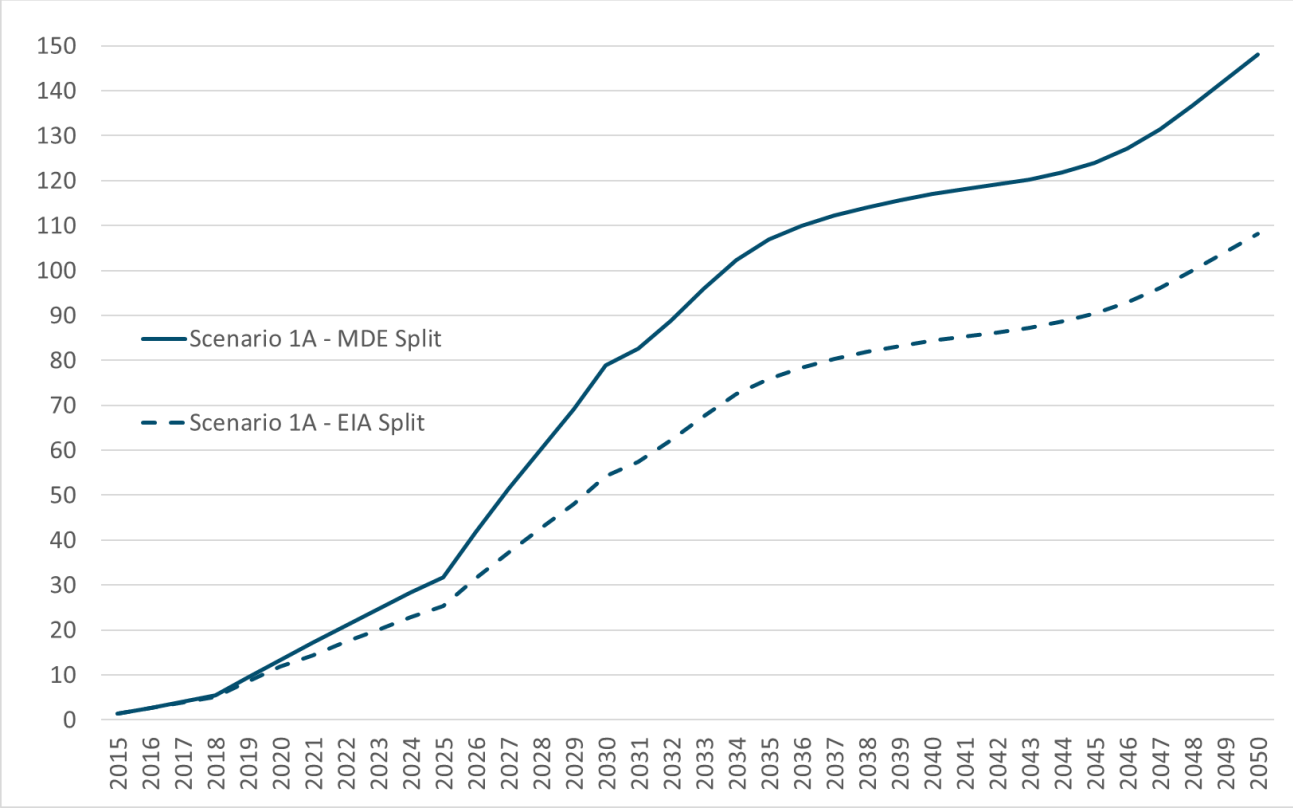


Car vs. truck sales split for MDE 2030 GGRA Plan vs. EIA 2022 AEO

Results – Annual ZEV Sales – MDE vs. EIA car vs. truck

The result is total ZEV sales for the EIA split are lower in the Reference Scenarios (1A and 1B) and the 2030 GGRA plan.

The MWG Scenario and three (3) ACC II-related scenarios assumed the same sales percentage split for both car and truck so are not affected.



Car vs. truck sales split for MDE 2030 GGRA Plan vs. EIA 2022 AEO

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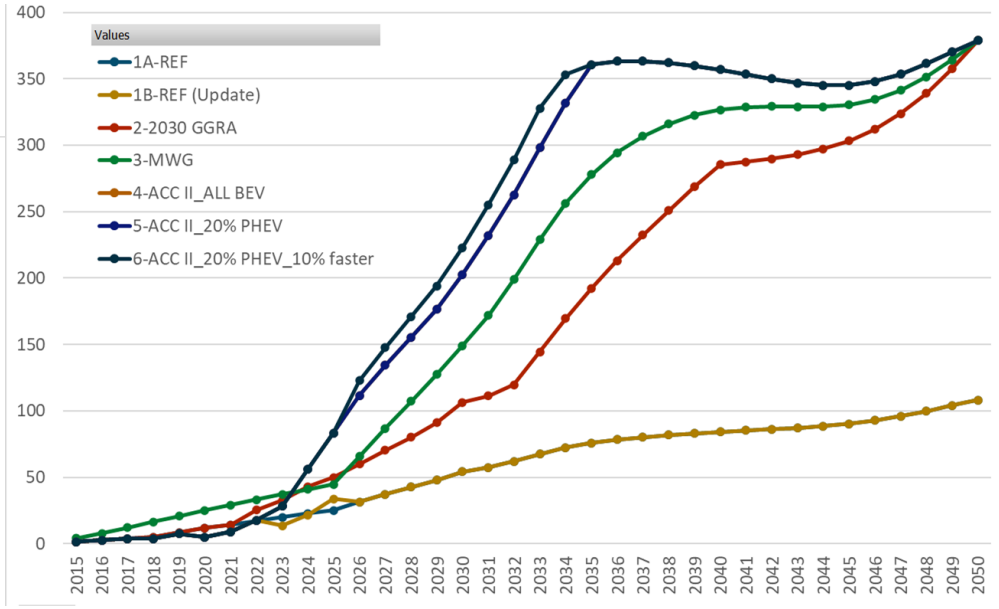
Results – Annual ZEV Sales

Results from here use the EIA 2022 AEO LDA / LDT sales split to be more realistic

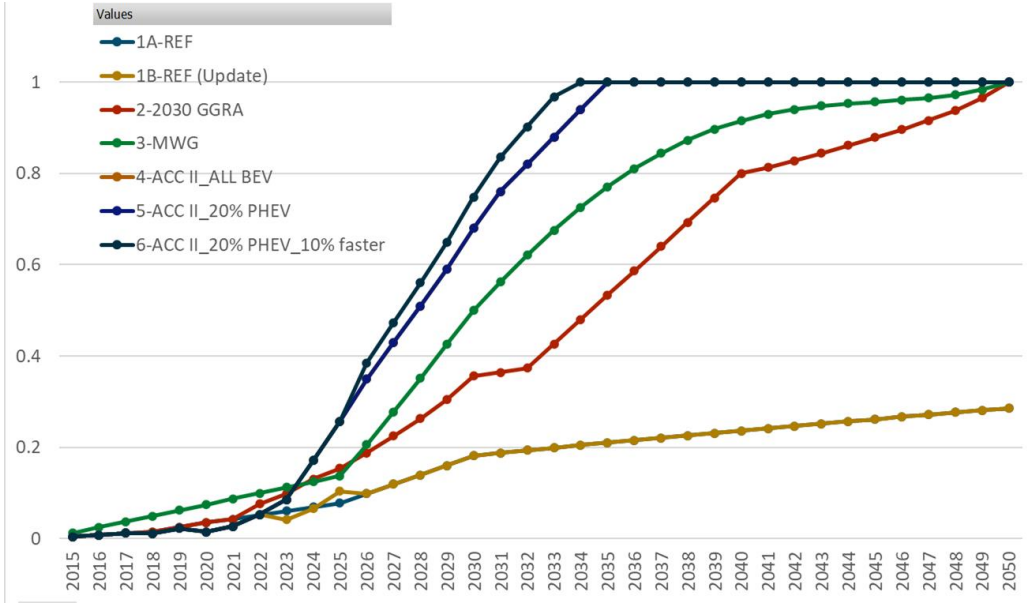
The tool predicts similar trends as in the 2030 GGRA Plan document for Reference Scenario (1A), updated Reference Scenarios (1B), 2030 GGRA Plan, and MWG

The ACC II-based scenarios (#4 and #5) overlay each other; total number of ZEVs is the same. (The vehicle type [BEV vs. PHEV] is the only difference). Sales sharply increase starting in the 2023-2025 transition period that leads into the ACC II adoption starting in 2026. LDV sales are 100% in 2035+.

The (very optimistic) accelerated ACC II scenario #6 reaches 100% only one year earlier.



Annual LDV ZEV sales (1000s)

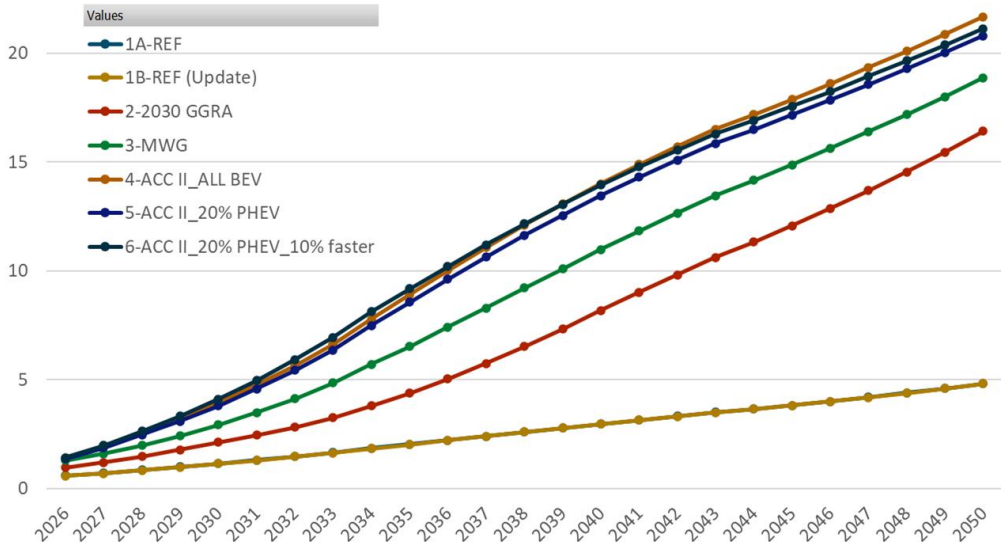


Annual LDV ZEV sales (% of LDV sales)

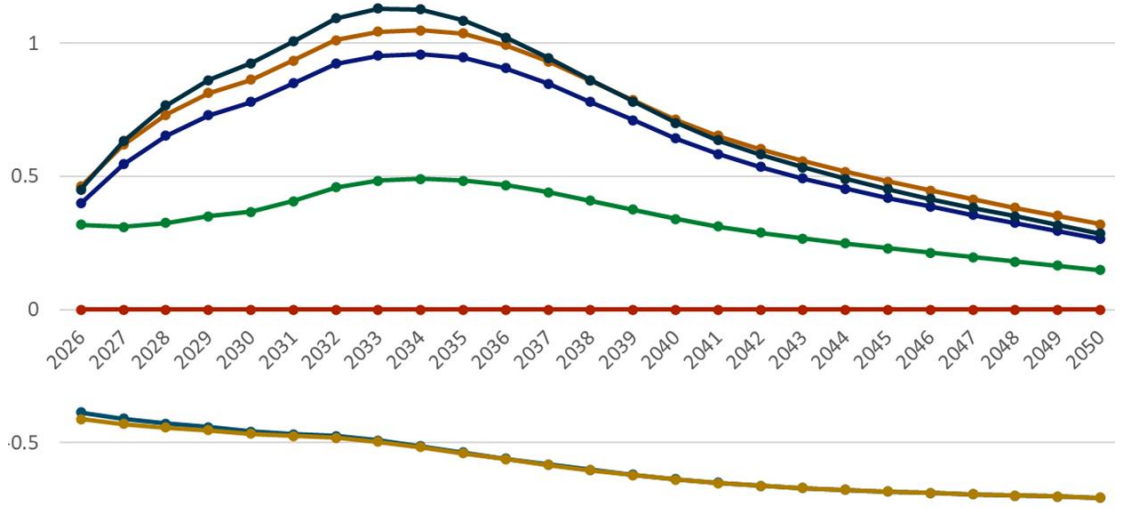
Results – Avoided Emissions – GHG

Avoided GHG emissions savings are due to the volume of gasoline usage that is avoided. As expected, the GHG emissions savings of the ACC II-related scenarios (#4, #5, and #6) shows similar improvements in avoided GHG savings (left plot). The difference from the 2030 GGRA Plan and MWG scenarios is a faster GHG reduction and a higher ultimate annual GHG reduction by 2050.

The right plot shows the % of GHG savings by year versus compared to the approved 2030 GGRA plan scenario. The ACC II-related scenarios' accelerated ZEV sales result in a large percentage increased savings through 2035 (full implementation at 100% of sales). The relative percentage savings in later years declines because the ZEV adoption in the 2030 GGRA Plan and MWG scenarios approaches the ACC II-related scenarios.



GHG savings over baseline (MMT CO_2e)

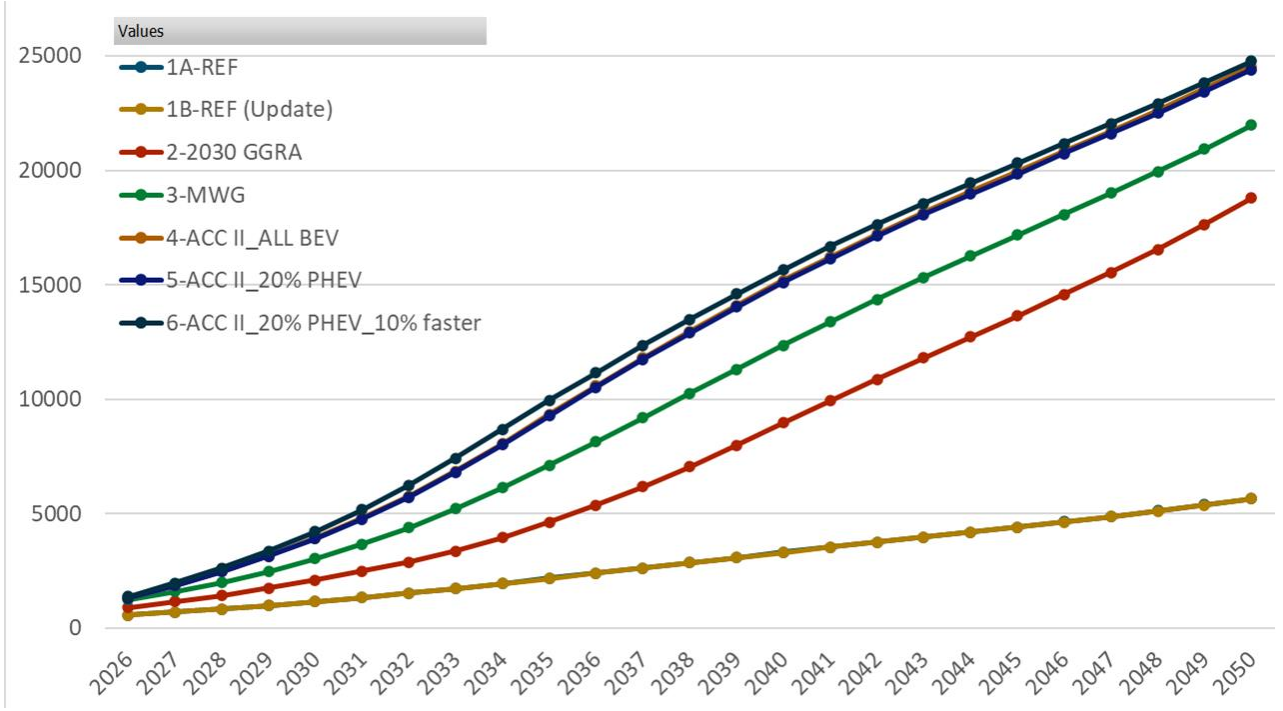


GHG savings versus the GGRA 2030 Plan Scenario (%)

Results – Electricity Generation – ZEV Charging Energy

The electrical energy required to charge ZEVs was estimated using information including: 1) average annual VMT, 2) average/typical energy consumption (from CARB's incremental cost evaluation tool; using 2025 LDA and LDT category averages), and 3) a charging infrastructure efficiency of 90%.

The plot below summarizes the ZEV electricity requirements (GWh) to charge the ZEV stock

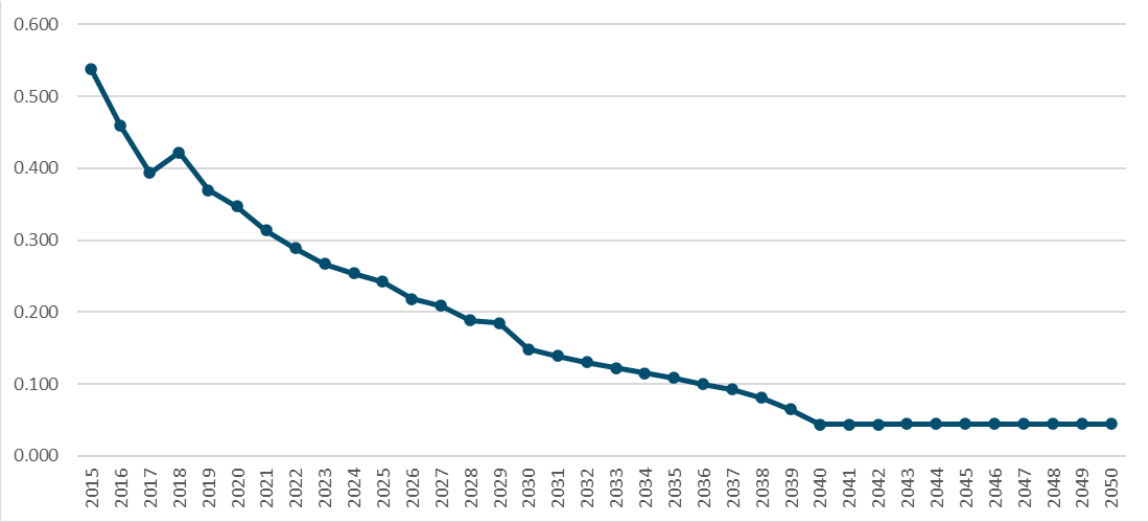


ZEV Electricity Charging Energy Requirement (GWh)

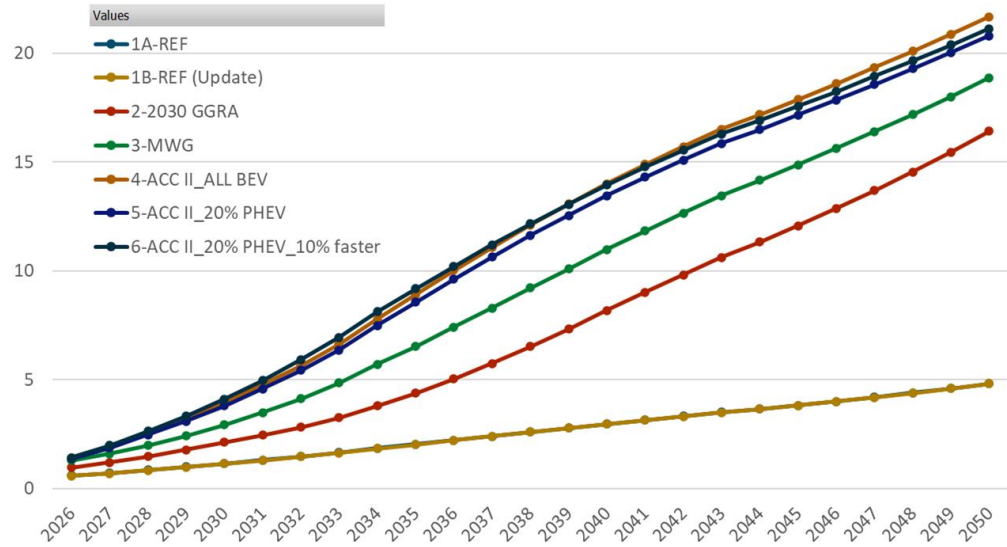
Results – Net GHG Reductions

Electricity GHG emissions for charging ZEVs assumes that the GHG associated with electricity generation will dramatically decrease per 2030 GGRA Plan.

The net GHG reductions (Avoided Emissions + Electricity Generation Emissions) are shown in the plot at the bottom right. The significantly decreasing Overall Emissions Intensity as the ZEV population significantly increases results in only a small reduction in GHG savings



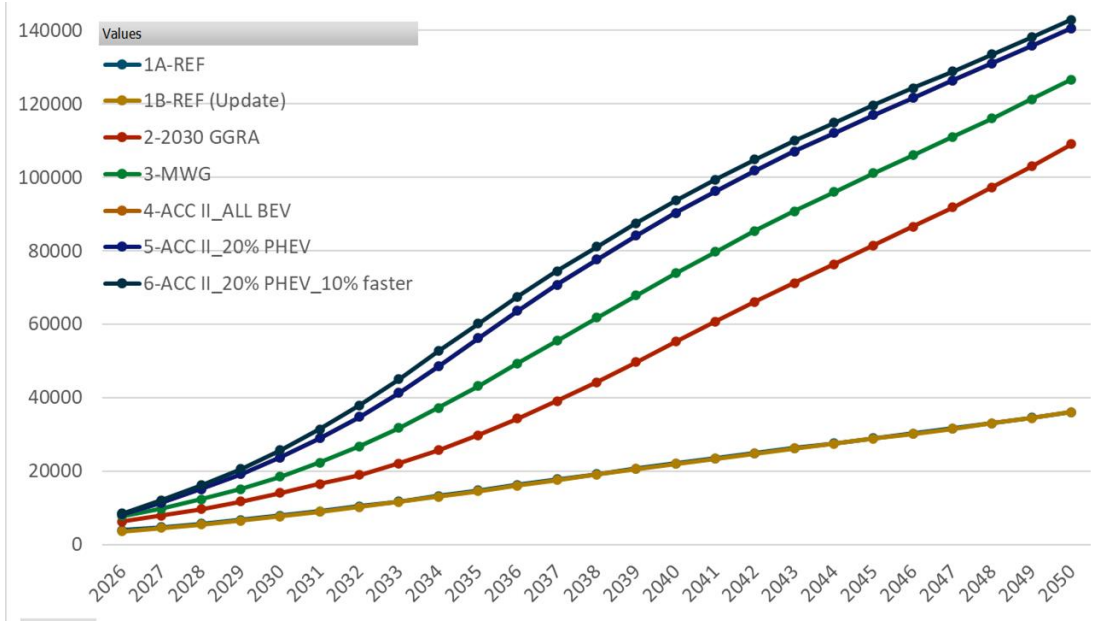
2030 GGRA Plan Electricity Generation Overall Emissions Intensity (MTCO2e/MWh)



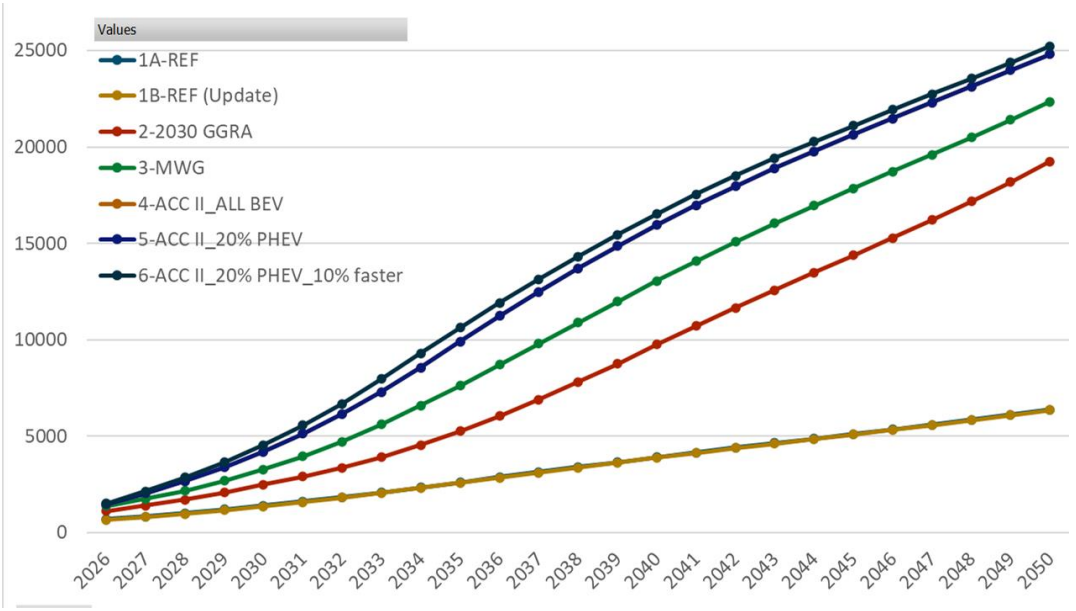
GHG savings over baseline (MMT CO_2e)

Charging Infrastructure – Total Number of Public Charging Stations

- The number of AC Level 2 public charging ports (85% of the total public charging ports) for a 10:1 ZEV to charging port ratio are shown.
  - Installing higher power AC Level 2 (than the typical 6.6 kW) would increase the potential number of ZEVs served to increase the maximum charging station throughput and could reduce the number of needed charging ports.
- The number of public DCFC charging ports (taken at 15% of the total public charging ports)
- The trends are identical to the ZEV population trend since the charging port need scales with ZEV population



Total public AC Level 2 charging ports (10:1 ZEV:charging port ratio)



Total public DCFC charging ports (10:1 ZEV:charging port ratio)

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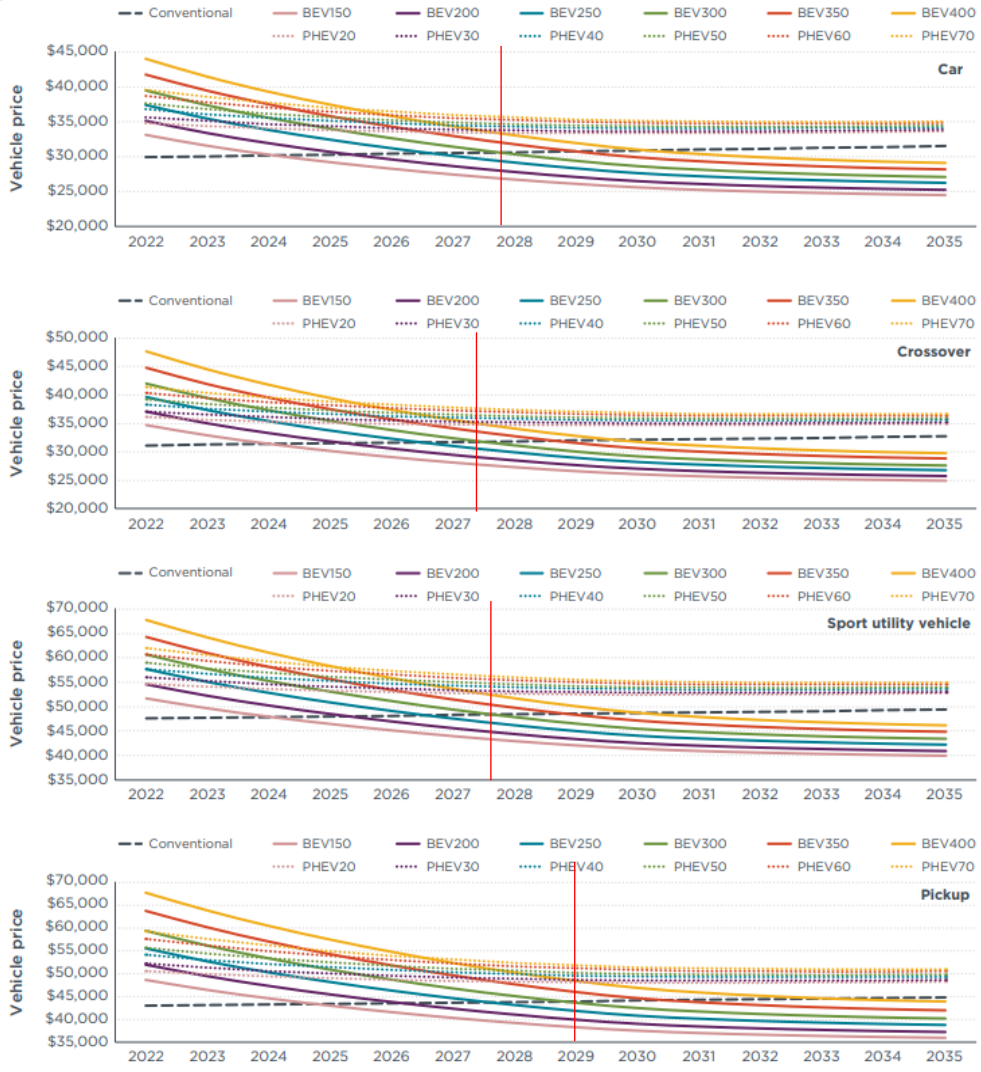
ZEV Availability and Price

- **ZEV availability**
  - All major OEs are increasing ZEV models and production (in the U.S. and globally). Most mass market brands are planning to be ~40-50% EV by 2030; premium brands are higher at 50-100%.
  - OEs are releasing many/multiple vehicle options across the brands and vehicle types that matches consumer demand.
  - Vehicle OEs need to meet ZEV sales targets in CA states, so ZEV vehicle availability (#s) will be higher in these states.
- **Battery price and availability**
  - Demand for ZEV batteries is increasing dramatically in the U.S. and globally. U.S. is not currently the leading consumer.
  - Battery and vehicle manufacturers are focused on addressing via material sourcing, different battery chemistries (reduced use of critical materials [e.g., Li, Co, Ni] in current chemistries and new battery chemistries).
- **Factors that will/could slow ZEV adoption** – 1) supply chain issues (near-term), 2) battery costs, 3) battery availability, 4) insufficient public charging infrastructure, 5) current high-cost vehicles, 6) uncertainty/ unavailability of federal incentive (near-term), 7) inflation/interest rates, and 8) potential vehicle manufacturer changing approach to sales/inventory,

Projected Trends in ZEV Transaction Price - ICCT

- BEVs with lower range reach cost parity (without any federal/state incentives) with comparable ICE vehicles sooner than large, long-range BEVs. (Red lines indicate BEV300)
- **Takeaway: All BEVs are projected to cost less than their ICE counterparts by 2035**
- **Takeaway: PHEVs are not projected to ever reach cost parity**
- ** Battery cost sensitivity could take an additional 2-6 years depending on vehicle type and battery capacity
- **** ICCT's analysis assumed that cost savings are passed to customers; automakers could instead maintain pricing to increase profits**
- CARB ACC II incremental cost evaluation tool generally agrees,
  - Lowest price cases is **without** cold weather package, eAWD, and towing package are similar to ICCT's
  - Highest cost cases is price, **with** cold weather package, eAWD, and towing package. Costs are higher than ICCT's by $8-10k+ without price parity for many years
- Alliance of Automotive Innovation agrees and expects vehicle price & utility to the customer parity. Not if; when.



Source: ICCT; Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits In The United State In The 2022-2035 Timeframe

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Existing Programs & Policies: Vehicle Purchase

Sales Tax Exemption for New ZEV Purchases

- Plug-in vehicles with manufacturer suggested retail price (MSRP) <$50,000 qualify for exemption from sales tax of 6%
  - Maximum value of exemption is therefore $3,000
  - However common BEVs such as the Nissan Leaf or Chevy Bolt would receive approximately $1,700-$1,800
- No pickup trucks would currently qualify for any sales tax exemption
- Used vehicles do no currently qualify for any sales tax exemption
- The sales tax exemption can be applied directly at point-of-sale. This is a best practice for motivating ZEV purchases.
- The sales tax exemption is very funding constrained. The FY24 budget ($8.25 M) might provide approximately 4,000 incentives – and be gone in 2-3 months
- This kind of start-stop of incentive greatly diminishes impact on the market

Recommendations for State Action: Summary*

1. Ensure sustainable funding for state sales tax exemption
2. Initiate a dealer support and engagement program
3. Provide financial and technical support to commercial and high-use governmental fleet conversion
4. Encourage ZEV initiatives and partnerships with ride-hailing services
5. Within 2-years, extend sales tax exemption to used ZEV, introduce incentives for low-income households, and lift the MSRP cap for pickup trucks

** Recommendations for ZEV Charging are presented in a later section*

ZEV Purchase Incentive Budget

Illustrative Budget Scenarios

1. **Current budget**: Budget constrained at current allocation, independent of sales

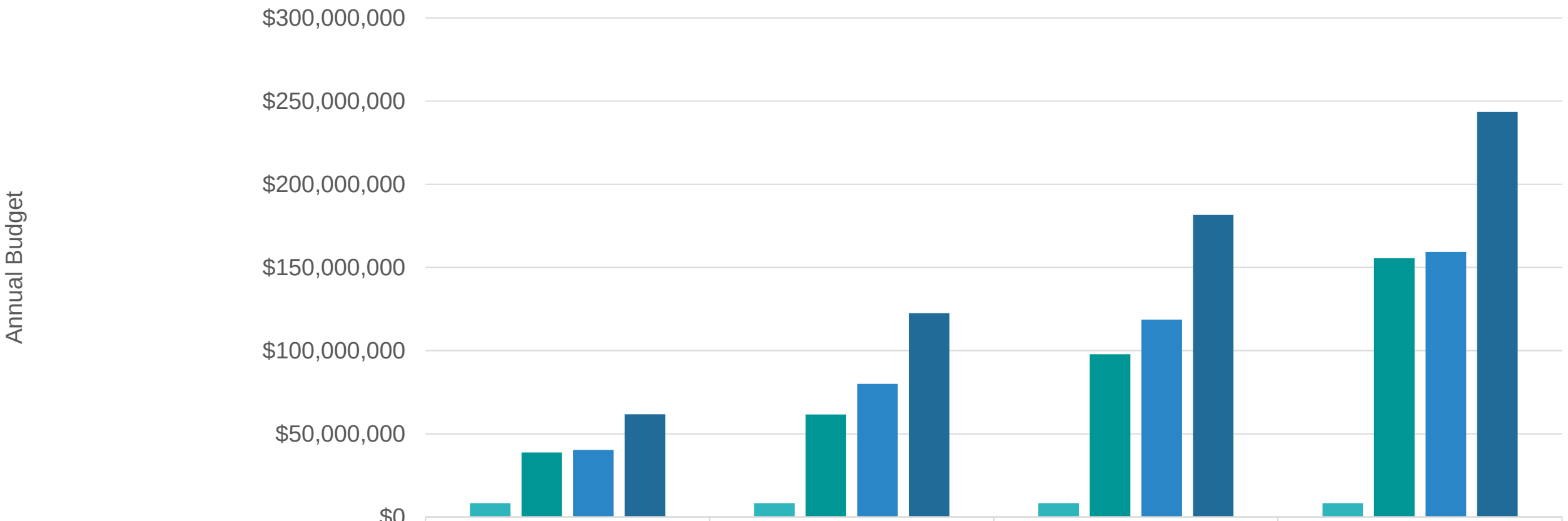
1. **Sustained budget**: Sufficient funding to provide sales tax exemptions on an annual basis, under current program structure, assuming year over year growth in recent years (2019-2022 average ~55%)

2. **ACC II Case**: Sales growth consistent with ACC II requirements (with mix of BEV and PHEV)

3. **ACC II Case w/ Used** + **Trucks**: Same as previous, with (a) qualifying used vehicles = 15% of new vehicle sales, and (b) eligibility for trucks

- Scenarios assume 90% of cars qualify for the tax exemption, with an average MSRP of $38,000
- Scenarios 2-3 assume 25% of larger SUVs/trucks qualify, with average MSRP of $49,000; Scenario 4 assumes 7% qualify with an average MSRP of $55,000

ZEV Purchase Incentive Budget



	2023	2024	2025	2026
Current Funding	$8,250,000	$8,250,000	$8,250,000	$8,250,000
Sustained BAU	$38,722,157	$61,563,086	$97,877,129	$155,611,633
ACC II PHEV Case	$40,341,689	$80,060,349	$118,695,486	$159,281,497
ACC II PHEV Case w/ Used & Trucks	$61,703,779	$122,454,617	$181,548,175	$243,525,994

Looking Outside of Maryland

Multiple states have adopted a higher MSRP limit and/or higher incentive values to increase adoption of light duty trucks

- California has an MSRP limit of $60,000 for SUVs and pickups (the limit for cars is $45,000)
- Colorado provides a $2,800 incentive on trucks (it is $2,000 for cars)
- Maine has an MSRP limit of $65,000 - $75,000 for trucks, depending on battery range (the limit for cars is $50,000)

Recommendations for State Action: Equity in ZEV Incentives

- New vehicles are inherently out of reach for a large portion of Maryland households, even those not considered “low income”
- Used ZEV markets are currently very limited, but are expected to grow

- To increase equity of ZEV adoption, within two (2) years, Maryland should extend the sales tax exemption to used ZEVs and establish an additional low-income incentive

- Extending the sales tax exemption to used vehicles is relatively straight forward
  - Each vehicle should receive one used vehicle sales tax exemption in its lifetime; similar to the federal tax credit for used ZEVs
  - It can be limited to dealership sales

- A low-income incentive should be provided at point-of-sale, to reduce the amount the individual must pay or finance
  - Income eligibility can be demonstrated through multiple means, especially via demonstrated qualification for any existing income-based assistance program

Recommendations for State Action: Equity in ZEV Incentives

- Extending the sales tax exemption to used EVs would provide an incentive of approximately $600-1,000 for typical vehicles being sold at this time.
- Alone that is unlikely to significantly spur low-income car buyers to chose a more expense EV.

- An additional incentive of $1,000-$2,500 for low-income households would address incremental upfront costs for used EVs.
- A higher incentive is needed to offset the higher incremental costs for low-income purchases of new EVs, e.g., $3,000-$4,000, in addition to the sales tax exemption.

- Even with incentives in this range, participation is likely to be constrained by available vehicles and charging solutions.
  - This means the near-term budgetary impact of low-income incentives would likely be less, compared to the cost of the sales tax exemption for new vehicles which is likely going to moderate and higher-income households

Looking Outside of Maryland

- **Washington** state and **New Jersey** offer sales tax exemptions and include used vehicles
  - Washington has an MSRP cap for tax exemption of $45,000 for new vehicles and $30,000 for used vehicles
  - New Jersey also offers a direct vehicle purchase incentive on top of the tax exemption

- **Oregon** offers an income-eligible Charge Ahead incentive of $5,000 that can go toward a new or used ZEV purchase; for a new EV, it can stack with an $2,500 incentive for $7,500 total

- The **Vermont** MileageSmart program includes opportunities for financial coaching and requires vehicle sales at or below market value (to try to avoid dealer mark-ups taking advantage of the incentive offer)

Looking Outside of Maryland

- **Maine** provides a low-income incentive for new BEVs of $7,500 (compared to its standard incentive of $1,000); lower amounts are available for new PHEVs ($3,000 for low-income; $500 for others)
  - Used vehicles are also eligible for an incentive of $2,500 for low-income households only
  - All incentives are offered at point-of-sale through participating dealerships
  - Low-income customers complete a pre-purchase application with multiple options for income verification, including demonstrated qualification for most other income-based state assistance programs
  - (Maine also offers mid-level incentives for new BEV and PHEV for moderate-income households)

Recommendations for State Action: Fleet Conversion

- Providing technical support to help fleet managers pursue economic fleet conversion strategies can be a relatively low-cost way to increase fleet conversion
- Maryland should target vehicle and EVSE incentive programs at vehicle fleets, which *may* have relatively high VMT per vehicle
  - In general, commercial fleets with the highest vehicle utilization will be the most economically motivated to begin conversion – and those conversions will also be associated with the highest GHG reduction
- Technical assistance can help fleet managers understand, assess and plan strategically around fleet conversion, including identification of grants or other funding sources
- Local governments and non-profits do not have ready access to federal tax incentives available to individuals and businesses; direct incentives are more important to these entities
  - The Inflation Reduction Act includes an option for direct payments to tax-exempt entities for the commercial tax incentive program, but the IRS has not yet issued guidance on this.

Looking Outside of Maryland

- **Maine** provides larger vehicle purchase incentives for fleets, combined with EVSE incentives
  - Local governments: $7,500 per new BEV ($2,500 for a PHEV)
  - Businesses: $2,000 per new BEV ($1,000 for a PHEV) – currently with a time-limited incentive of $3,000-$8,000 through an application process

- The **Rhode Island** Energy Office offers commercial customers with Fleet Advisory Studies

- The **Massachusetts** Clean Energy Center (MassCEC) offers electric school bus Advisory Services and Fleet Deployment Services
  - The Advisory Service aims to provide free electrification planning services for up to 25 school districts within the Commonwealth
  - The Fleet Deployment Service aims to provide each selected school bus fleet with up to $2M in flexible funding for electric school buses and associated charging infrastructure

Recommendations for State Action: Dealer Engagement

- Dealers are a critical link in vehicle purchasing decisions
- Dealerships and manufacturers may provide some training and education, but state programs, such as those in Vermont or Maine, provide more consistent and focused education, training and tools to support the ZEV sales process
  - Additional dealer engagement and support may be especially valuable in rural areas or disadvantaged communities
- Maryland should establish a program to increase outreach, education and training support to dealers, potentially in partnership with the Maryland Auto Dealers Association
- Maryland should consider either a per vehicle incentive and/or a stipend for dealers (e.g., $200) and salespeople who attend training sessions about ZEVs and customer needs
- Dealer engagement can also include targeting dealerships for EVSE installation (under existing EVSE incentive programs)

Looking Outside of Maryland

- **San Diego Gas & Electric** provides an $800/vehicle incentive to the dealer, half of which must go to the salesperson

- **New Jersey** also has a dealer engagement strategy, with materials such as this Dealer Guidebook.

- **Vermont** has a robust dealer engagement strategy (which is part of a larger "Drive Electric Vermont" program which includes outreach and education for the public and other stakeholders), including:

  - $800/vehicle incentive to participating dealers, half of which goes to salesperson
  - Facility infrastructure and training support covering 50% of the cost, up to $50,000 annually per dealer
  - Sales staff ZEV training requirement
  - ZEV point-of-sale displays and resources

Recommendations for Equitable Charging: Summary*

1. Increase funding for public charging stations with emphasis on increasing volume of high visibility/easy access AC Level 2 charging

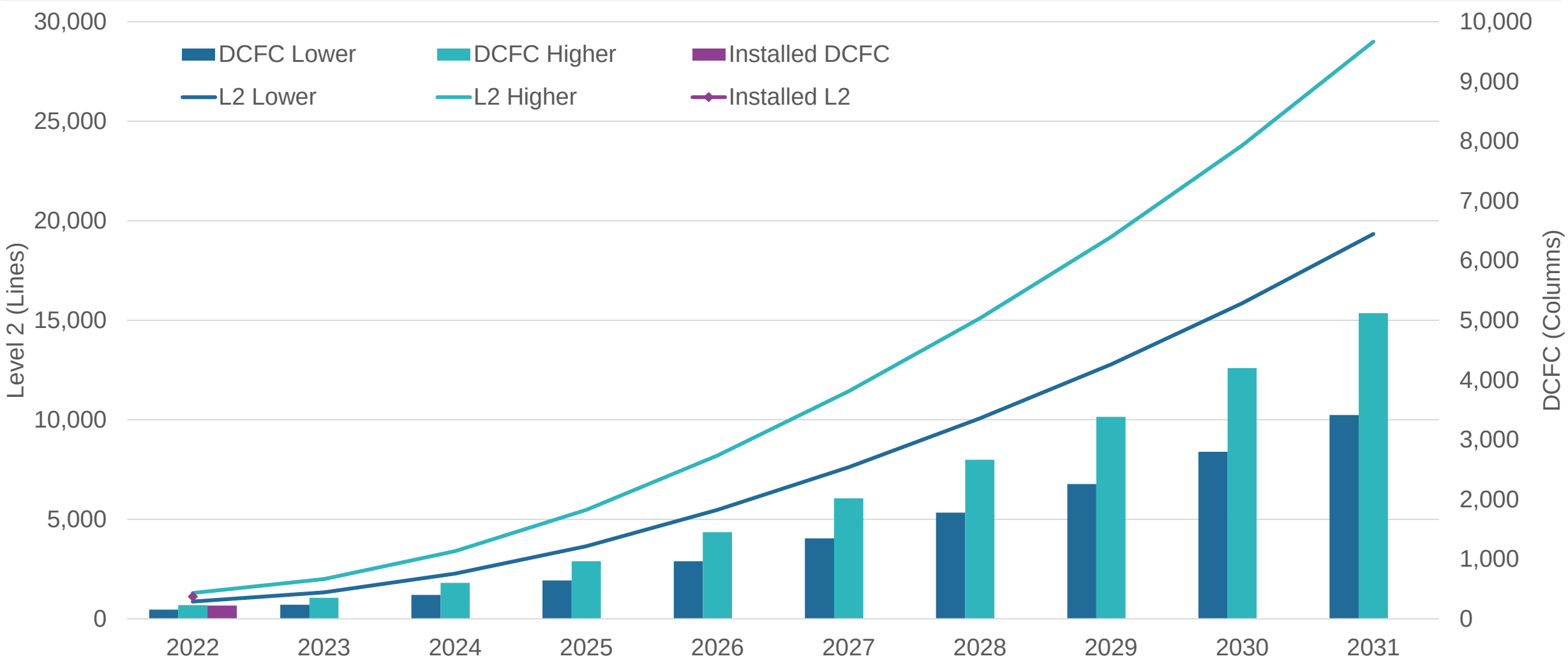
2. Set specific targets for charging investment in disadvantaged communities

3. Increase funding for charging stations to serve multi-family housing, including through utility programs

4. Update building codes to require charging or charging-ready new construction, especially for multi-family housing

** Recommendations for equity in incentive programs are presented earlier*

Estimates of Needed Charging Stations



Recommendations for State Action: Public Charging

- Maryland currently has approximately **1,120** AC Level 2 and **225** DCFC charging stations
- This is broadly consistent with the total number of charging ports needed to support the current number of ZEVs

- Total publicly-available AC Level 2 ports will need to grow steadily, to approximately **3,500–5,500 by 2025**, and 23,000–35,000 by 2031
- Needed DCFC ports are likely between **650–950 by 2025** and 4,000–6,000 by 2031

- To increase public acceptance and perception of convenience, Maryland should consider targeting the higher numbers in the near-term, especially of lower cost AC Level 2 stations
- Maryland should prioritize high visibility locations and complimentary investments (such as signage, mapping and promotional activities) that increase EVSE visibility

Recommendations for State Action: Public Charging

- Maryland should further align and coordinate EVSE support programs across state agencies and utilities to ensure easy-to-access, statewide support
  - MarylandEV.org is an excellent start for a unified (one-stop) information resource, however it could be enhanced with design or tools that target customer segments (for example, multifamily property owners, fleet managers, etc.)
  - Better economies of scale and more targeted outreach can occur if EVSE programs have less overlap
- Utilities are well suited to provide technical guidance around electrical interconnection, along with rebates (provided either by the utility or by an agency)
- Competitive solicitations or grant-making may be appropriate for certain DCFC installations, however incentives for AC Level 2 charging stations should be as predictable and streamlined as possible (i.e., applicants should always receive the incentive as long as they meet clear eligibility requirements)

Recommendations for Equitable Charging: DAC Targets

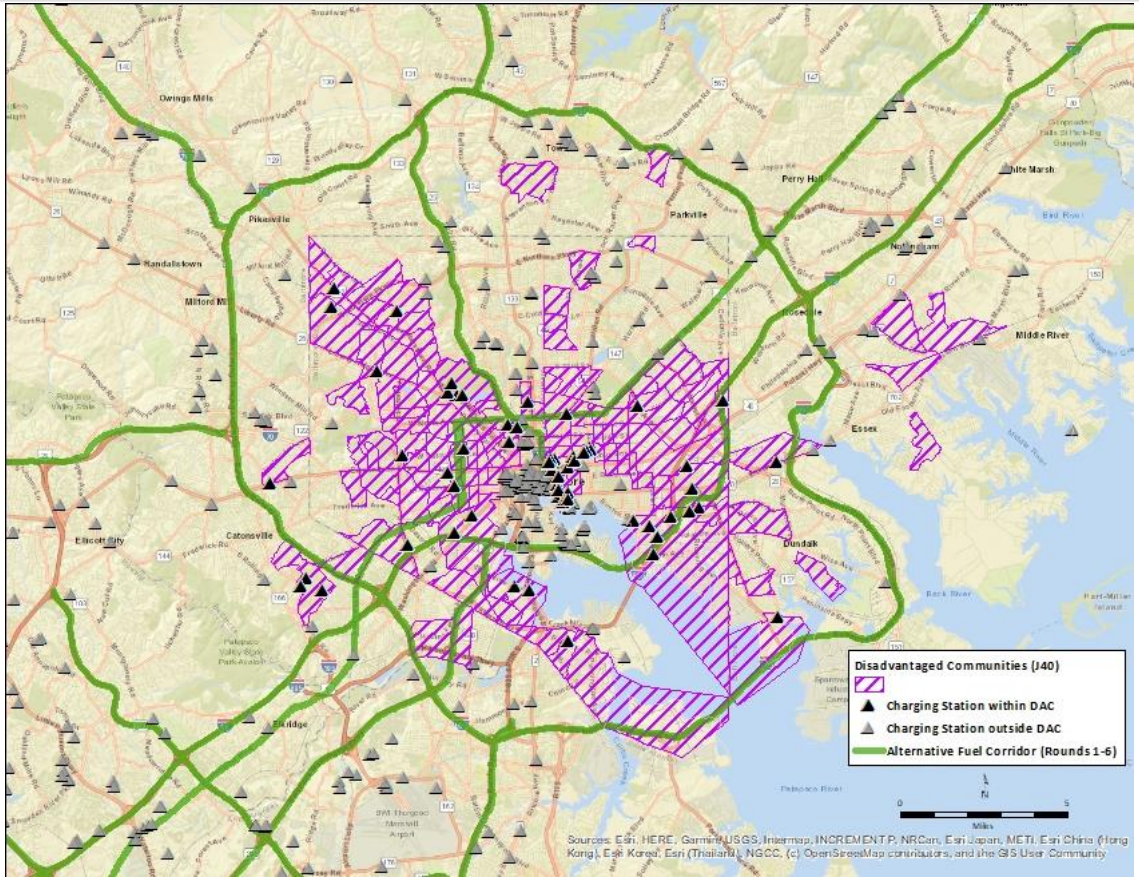
- As a starting point, Maryland should set targets for deployment of charging stations in Disadvantaged Communities (DAC) at least in proportion to the population in these areas

- 15.5% of Maryland's population lives in a census tract that meets the Justice 40 (J40) definition
- Currently 12% of Level 2 charging stations and 13% of DCFC stations are located in these areas

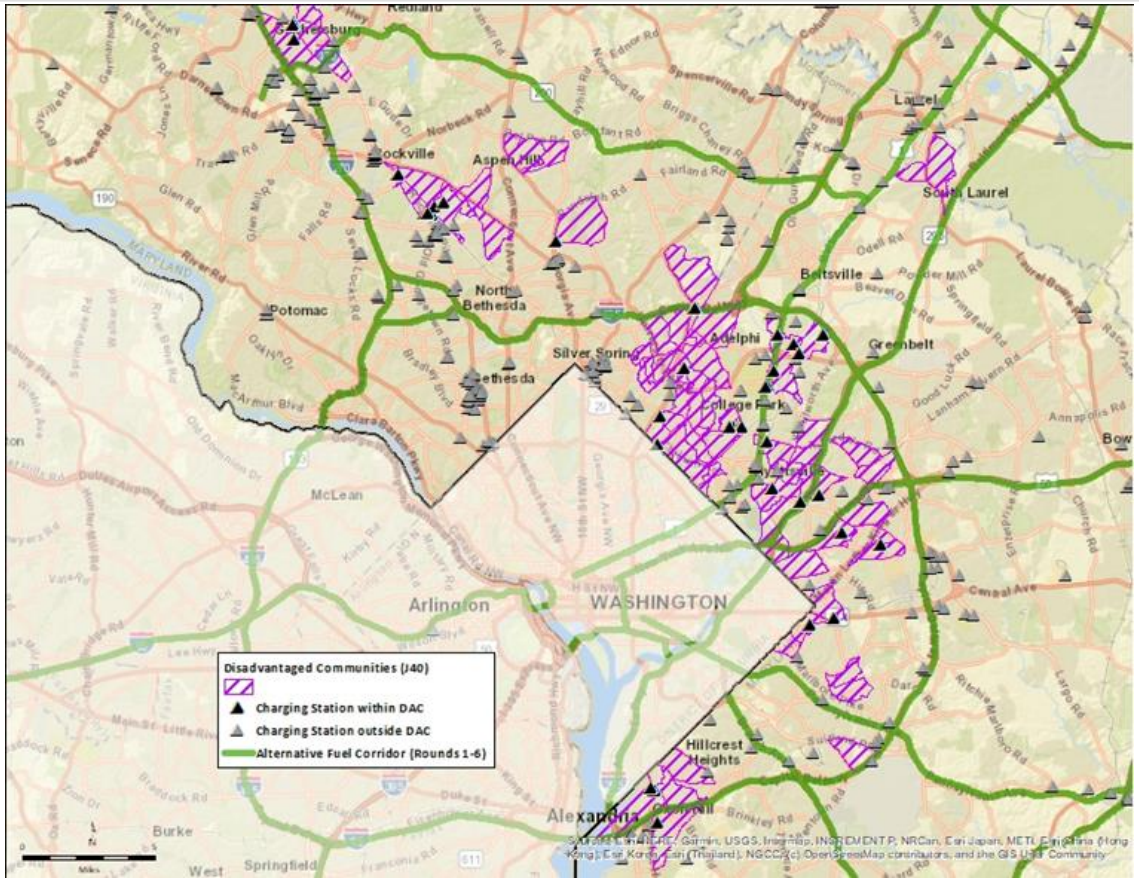
- By 2025, Maryland should target **550-850** Level 2 stations and **100-150** DCFC stations in DACs

- Even with strong equity policies and programs, ZEV ownership in DACs may lag that in the overall population, however publicly-available charging stations should not lag, especially in areas with greater proportions of multifamily households

Recommendations for Equitable Charging: DACs

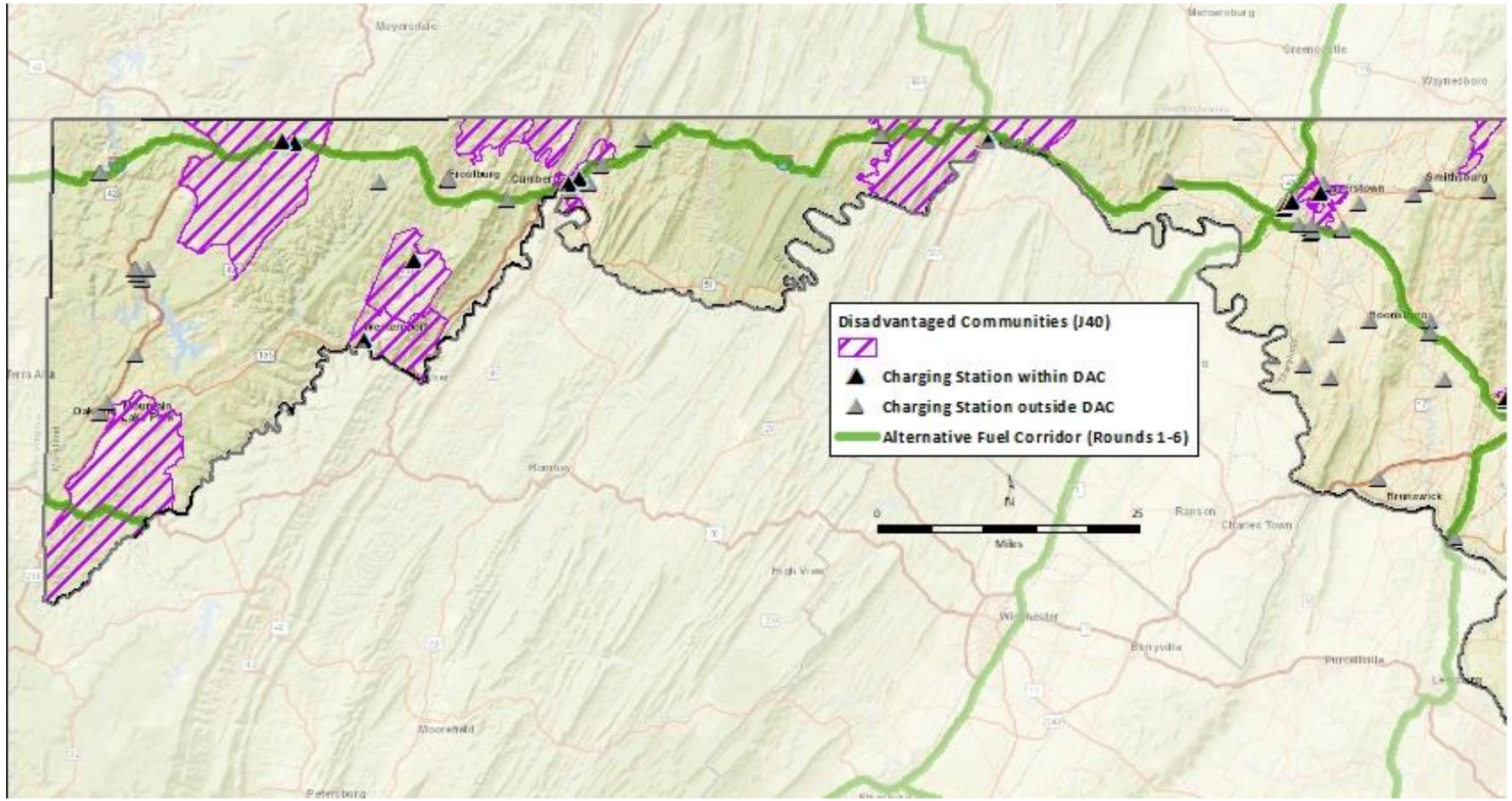


Baltimore metro area



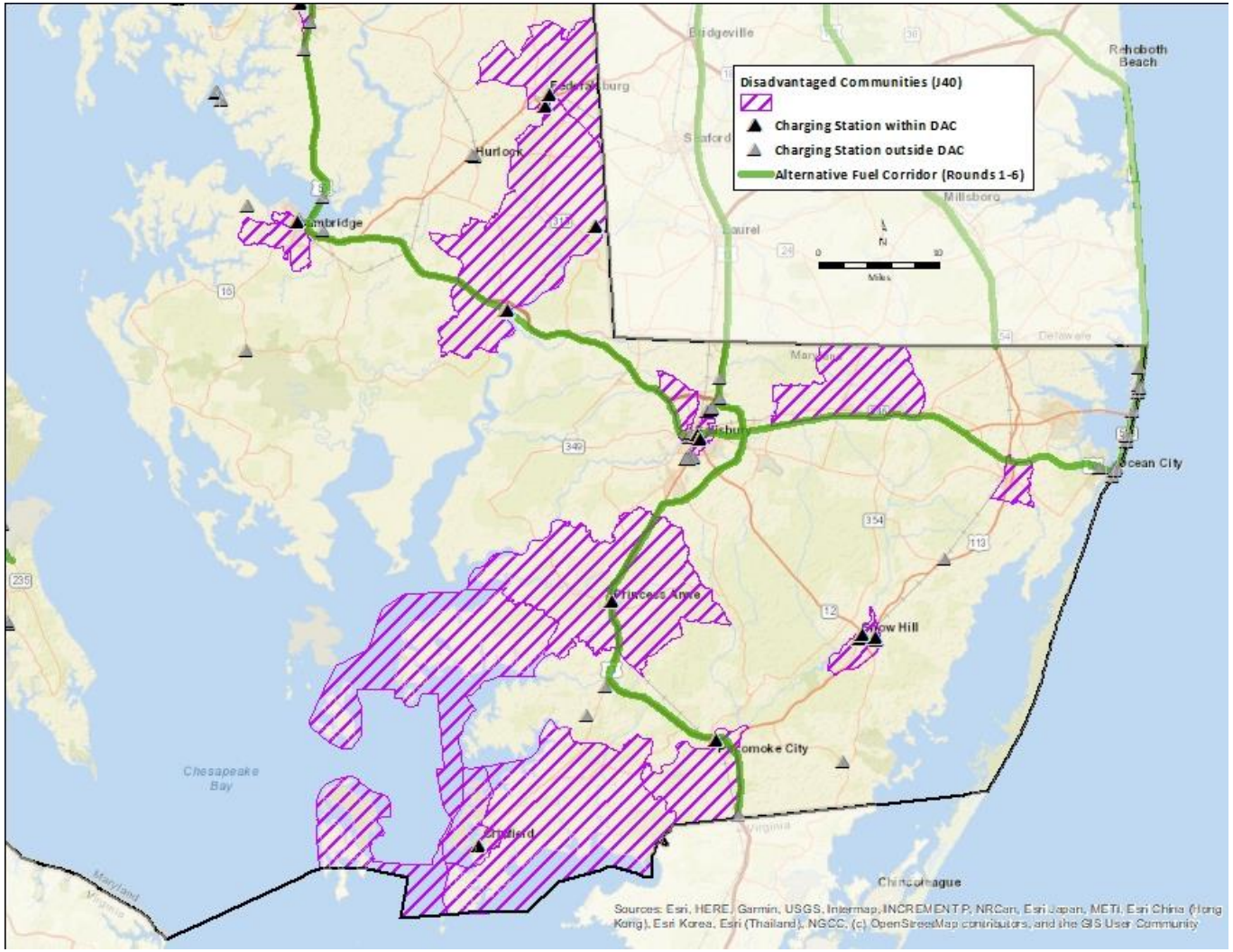
Suburban Washington DC metro area

Recommendations for Equitable Charging: DACs



Western Maryland

Recommendations for Equitable Charging: DACs



Lower Eastern Shore Maryland

Recommendations for Equitable Charging: Multifamily

- From an equity perspective, it is critical that Maryland put particular emphasis on supporting ZEV charging for multifamily (MF) buildings
- Approximately 45% of Maryland households are renter-occupied (although not synonymous with living in a MF building, they are closely related)

- MF households and properties may face multiple challenges not faced by owner-occupied, single-family households/buildings, including:
  - Lack of off-street parking
  - Split occupant-landlord incentive for investing in EVSE
  - Correlation with lower household incomes
  - Older electrical infrastructure or more challenging interconnection requirements
  - Need for fee-based charging

- Utility and state-based EVSE programs should prioritize multifamily housing for outreach and financial incentives

Recommendations for Equitable Charging: Multifamily

- EVSE programs should prioritize incentives and technical support for ZEV charging located wherever MF occupants park their cars overnight
  - Where only on-street parking is used, designated curbside parking should be installed;
  - Where this is not feasible, allowing residents to use AC Level 1 ZEV charging cords that cross the sidewalk right-of-way is a low-cost option that may work for some households. Detailed programs have been deployed by Seattle, WA, Portland, OR, and Washington, DC.
- In addition, state agencies should actively develop and promote solutions for community-based and MF-adjacent overnight ZEV parking
  - In some areas with dense MF housing, greater penetration of workplace charging can also play a role in increasing equitable access to charging
- Incentives for MF EVSE should be a priority, especially in disadvantaged communities

Recommendations for Equitable Charging: Financial Support

- Maryland should plan for a relatively higher share of public financial support for EVSE over the next 3-5 years because utilization levels will be low and the business case for private investment in non-private charging is weaker

- As a broad illustration, if Maryland provided an average incentive of $2,500 per public AC Level 2 port and $4,000 per port in DACs, the total budget would need to be *at least*:
  - $1.5 million for DACs in 2024, rising to $3.5 million in 2026, plus
  - $5 million elsewhere in 2024, rising to $11 million in 2026

- For DCFC, with illustrative incentives of $30,000 per port and $50,000 in DACs, total budgets would need to be at least:
  - $3 million for DACs in 2024, rising to $7.5 million in 2026, plus
  - $10 million elsewhere in 2024, rising to $25 million in 2026

- These statewide averages illustrate the scale of public investment; actual incentive amounts may need to be higher and individual programs must be designed with end-uses in mind

Recommendations for Equitable Charging: Building Codes

- **Maryland should adopt model amendments to the IECC 2021 that require ZEV charging or "EV-ready" infrastructure in single family, multifamily and/or commercial construction**
- It is especially important to incorporate ZEV charging into new multi-unit dwelling (MUD) construction, because this is one of the most challenging spaces for charging retrofits
- The International Code Council documents possible amendments in its publication "2021 Electric Vehicles and Building Codes: A Strategy for Greenhouse Gas Reductions"

MUD requirement examples:

- Orlando, FL: 20% of spaces must be "EV-capable"
- Washington, DC: 20% must be "EV-ready" (3 spaces or more)
- Denver, CO: 5% must be EV-installed, plus 15% EV-ready and 80% EV-capable (e.g., 100% at least EV-capable
- Chicago, IL: 20% EV-ready (5 spaces or more)
- Seattle, WA: 100% EV-ready (up to 6 spaces); 20% EV-ready (7 or more spaces)