

Scenario 1: Technology

I. Agency Considerations in a Future where the Majority of New Vehicle Sales are Zero- Tailpipe Emission Technologies

Alternative Regulatory Structures



- Shift from

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Mobile Sources	Stationary Sources
Tailpipe	Powerplant Smokestacks
Aftertreatment/ OBD vehicle systems	Battery Mineral Extraction, Refining and Transportation

- Develop global technical regulations on battery durability including OEM certification of range or battery energy
- Monitor, collect data, and understand the emissions inventory, battery energy and range to guide the agency on key areas of focus

Approaches to Emissions Averages

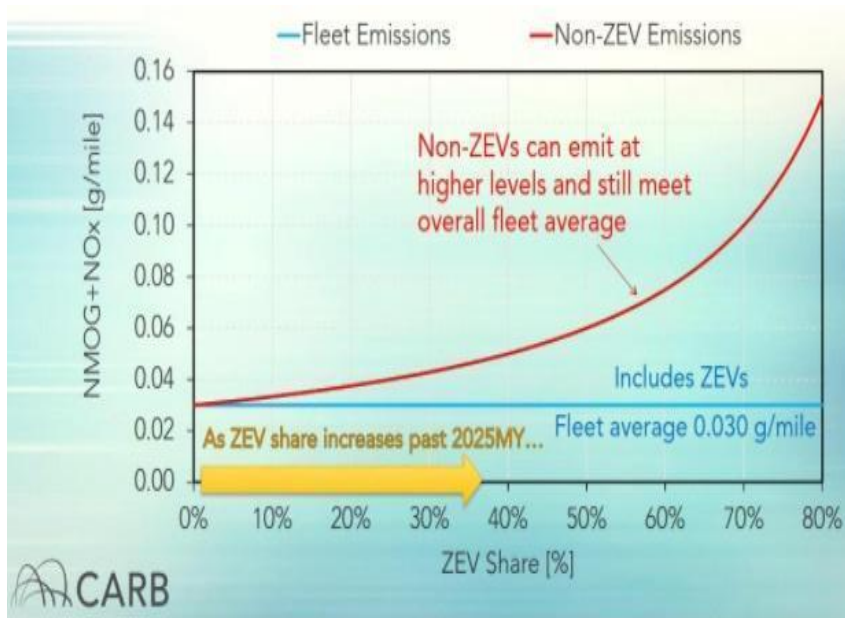
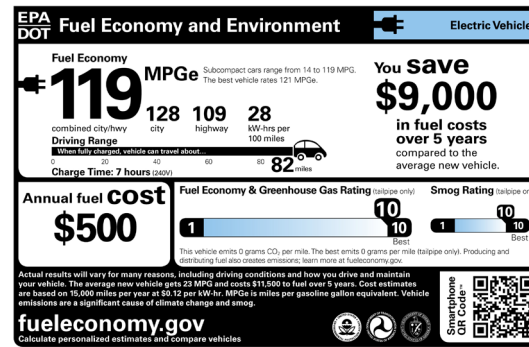


Figure 1: CARB presentation illustrating NMOG+NO_x “backsliding” concept. (California Air Resources Board, 2020).

- Fleet-average emissions reimagination needed to accommodate ZEVs, viable approaches include
 - Placing a ceiling on NMOG+NO_x emissions
 - ICEVs and ZEVs continue as a combined fleet average - standards set using a cost-benefit basis.
- Continuous agency monitoring provides information on total fleet emissions, directing appropriate controls

Electric Vehicle Efficiency Standards



- Understanding PEVs' grid impacts requires understanding vehicle efficiency
- EPA already tracks MPGe and communicates kWh/100mi information on vehicle window labels
- Should PEV electric efficiency be regulated? No clear answer.
 - Ensuring higher efficiency would put downward pressure on PEVs' grid demands
 - However, increased renewables in grid will lower environmental impact of PEV charging, regardless of vehicle efficiency
- Grid impacts aside, EV efficiency standards could materials-based environmental impacts
- OEMs are already highly motivated to improve efficiency, to address range anxiety

Recommendations

- Evaluate whether there is need for electric vehicle efficiency standards. Consider the impact of existing market drivers including consumers' demand for adequate vehicle range, as well as the role of continued customer choice in furthering ZEV adoption
- Consider which agenc(ies) are best suited to address this issue. EPA has longstanding expertise with emissions and vehicle regulations; DOE has longstanding experience setting minimum efficiency standards for a wide range of household appliances

Leveraging Fleets & CASE



- During transition to carbon neutrality, explore creative and targeted approaches to particular segments—such as fleets, including ride-hailing operations—to accelerate adoption
- Fleets are well-suited for early and accelerated electrification because they often perform a large share of stop-and-go urban driving or defined routes.
- Annually evaluate and report on the pace of transportation:
 - “revolutions” that are likely to impact air quality, including (but not limited to) connected, automated, shared and electric mobility
 - “evolutions” that are likely to impact air quality, including micromobility, public transit, goods movement, and livable communities



Ride-hailing in Henri Tudor’s electric car (c. 1902)

Equity



- **Identify high priority underserved communities for maximum benefit**
- **Consider both stationary and mobile sources, based on community pollution monitoring**
- **Identify potential barriers to accessing such technology or programs (cost, infrastructure, etc.) and establish programs to address**
- **Foster and maintain relationships with companies, manufacturers and community leaders to identify services needed in communities**
- **Provide continual outreach, support and funding opportunities to community-based organizations and non-profits for consumer education and advocacy focused on sustainable transportation**

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II. Agency Considerations During the Transition
Toward a Zero-Tailpipe Emission Technology Future



Steering an Industry Transformation

- As industry moves toward carbon neutrality, EPA should consider how potential changes in the passenger vehicle market could require additional or new regulatory approaches.
- Track emissions reductions progress from stationary sources, to further understand the transportation sector's well-to-wheels footprint
- Significant criteria emissions reductions have been realized; further reductions can be expected as fleets turn over
- Investment in nearer-term tech can deliver additional benefits, but there are opportunity costs involved for automakers with finite resources making long-lead-time investments.

Recommendations

- Continue cost-benefit analyses of:
 - Criteria emissions benefits of tighter tailpipe standards, relative to reductions from natural fleet turnover
 - GHG emissions benefits of greater market penetration of existing electrified vehicle technologies
- Study potential role of scrappage/retirement programs to accelerate emissions reductions. Such a study should consider effect on the used vehicle market, and potential impacts to underserved communities.

Understanding Consumer Adoption

- Important for EPA to maintain robust understanding of consumer adoption issues:
 - Up-front costs, infrastructure access, consumer awareness and other market barriers
 - Vehicle “parity,” including purchase price parity, performance/functionality/convenience parity, technology cost parity and total cost of ownership
 - Impacts of complementary policies, such as LCFS, HOV lane access, etc.

Recommendations

- EPA should play a convening/educating role and leverage its influence on consumer adoption of ZEVs
- EPA should consider how durable market-based policies for emissions reductions – including carbon taxes and cap-and-trade programs – can influence purchase decisions
- EPA should consider establishing a national Low Carbon Fuel Standard, implemented to support ZEV uptake and continued decarbonization of the transportation sector

Public Education

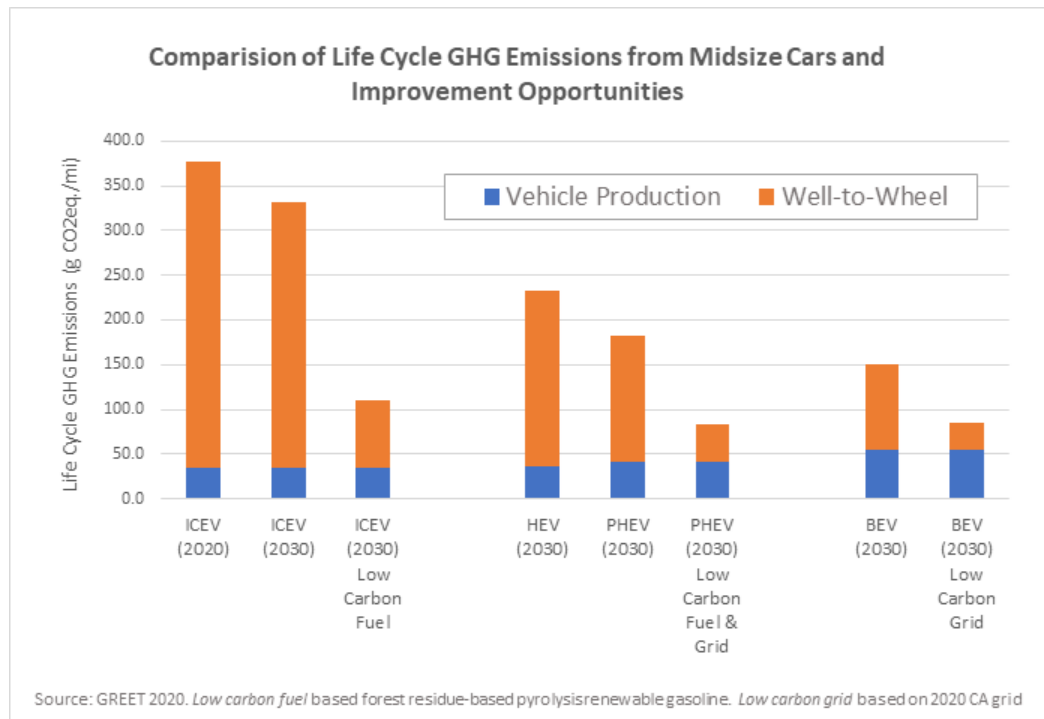
- Public education will be critical to fostering greater ZEV adoption
- EPA can fill a critical role in providing factual, unbiased information to businesses, schools and federal/state/local policymakers
- Consumer information on grid emissions, charging considerations, V2G

Recommendations

- Leverage focus groups to help identify public education strategies that address evolving consumer understanding of, and receptivity toward, vehicle electrification
- Provide educational materials on ZEVs, V2G, infrastructure and other critical information
- Working with constituents and community leaders, provide tailored information that addresses the diverse needs of various segments of the public



Driving Neutral And Low Carbon Fuels



- Considerations:

- Establishing a national Low Carbon Fuel Standard aimed at decarbonize liquid fuels, electricity and hydrogen
- Implement socially equitable carbon pricing
- LCA as a tool for reviewing progress while monitoring mobile CO2 reductions at the state level
- Implement policies to support vehicle to GRID integration

**Carbon reductions are needed across the board from transportation, energy/fuels and infrastructure.
Continue to treat fuels (energy) and vehicles (transportation) as a system.**



Issues Specific to Medium- and Heavy-Duty (MD/HD) Zero Emission Vehicles

- **Functional Capability** – much higher load and energy demands for MD/HD linked to heavy hauling/towing requirements
- **Infrastructure** – ZEV infrastructure (electricity and hydrogen) may be unfamiliar to fleets. New technology, fueling, charging, and operational logistics may pose challenges to fleets.
 - Electricity rates and hydrogen fuel costs need to provide value to fleets to facilitate easier transitions
- **Model availability** – Today's limited zero-emission MD/HD model selection is expected to change.
 - Fleets in market segments that have centralized re-charging/re-fueling and limited travel distances may benefit the most with compelling business cases.
 - Governmental fleets are best positioned to lead by example
- **Equity** – many MD/HD operate near ports, warehouses, and other freight hubs typically located near underserved communities; shifting to MD/HD ZEV provides benefit to these areas as well as to the environment