

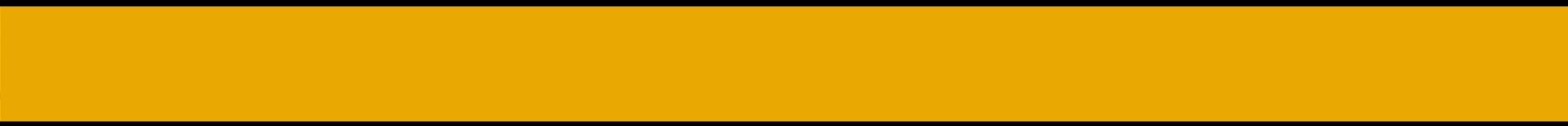
MDOT Climate Change

Status Update & Trends Overview



Mitigation Working Group of the
Maryland Commission on Climate Change

Sept. 26th, 2016



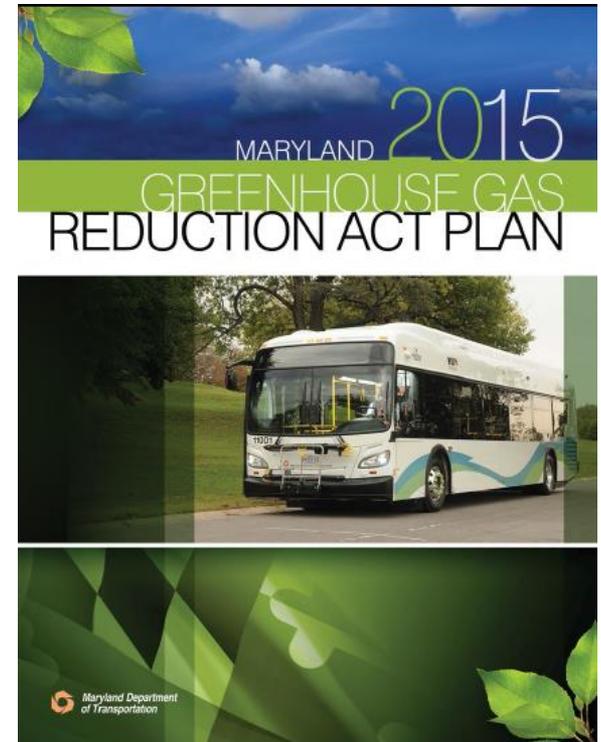
MDOT EFFORTS SUPPORTING THE GGRA AND MCCC



MDOT GGRA Implementation Plan – 2015

Consistent with the 2015 GGRA Plan update, with more specific detail on funding, emissions, successes, and next steps

- Transportation Plans and Programs
- Transportation Technologies
 - Clean Car, Federal LDV fuel economy standards
 - Federal M/HD Truck Standards
 - Fuel Standards – Tier3 and Renewable Fuel Standard
- Electric Vehicle Initiatives
- Airport, Port and Freight Initiatives
- Public Transportation
- Pricing Initiatives
- Active Transportation Planning



2009, 2011, and 2015 GGRA plans all posted on the MDOT [website](#).

2020 GHG Reductions and Costs

GGRA Policy ID	Strategy	2020 GHG Reduction (mmtCO ₂ e)	Total Costs (2015-20 CTP) (\$1,000)
E.1	Vehicle Technology and Fuel Standards	5.57	n/a
E.2.A	On-Road Technology	1.00	\$1,333,456
E.2.B	Airport Initiatives	0.04	\$12,077
E.2.C	Port Initiatives	0.03	\$38,605
E.2.D	Freight and Rail Programs	Included in On-Road	\$411,261
E.3	Electric and Low Emitting Vehicle Initiatives	0.25	\$500
F.1	Public Transportation Initiatives	1.61	\$3,612,336
F.2	Intercity Transportation Initiatives	0.16	\$391,908
G	Pricing Initiatives	1.99	\$287,047
H.2	Bike and Pedestrian Initiatives	0.07	\$160,131
TOTALS		10.72	\$6,247,321



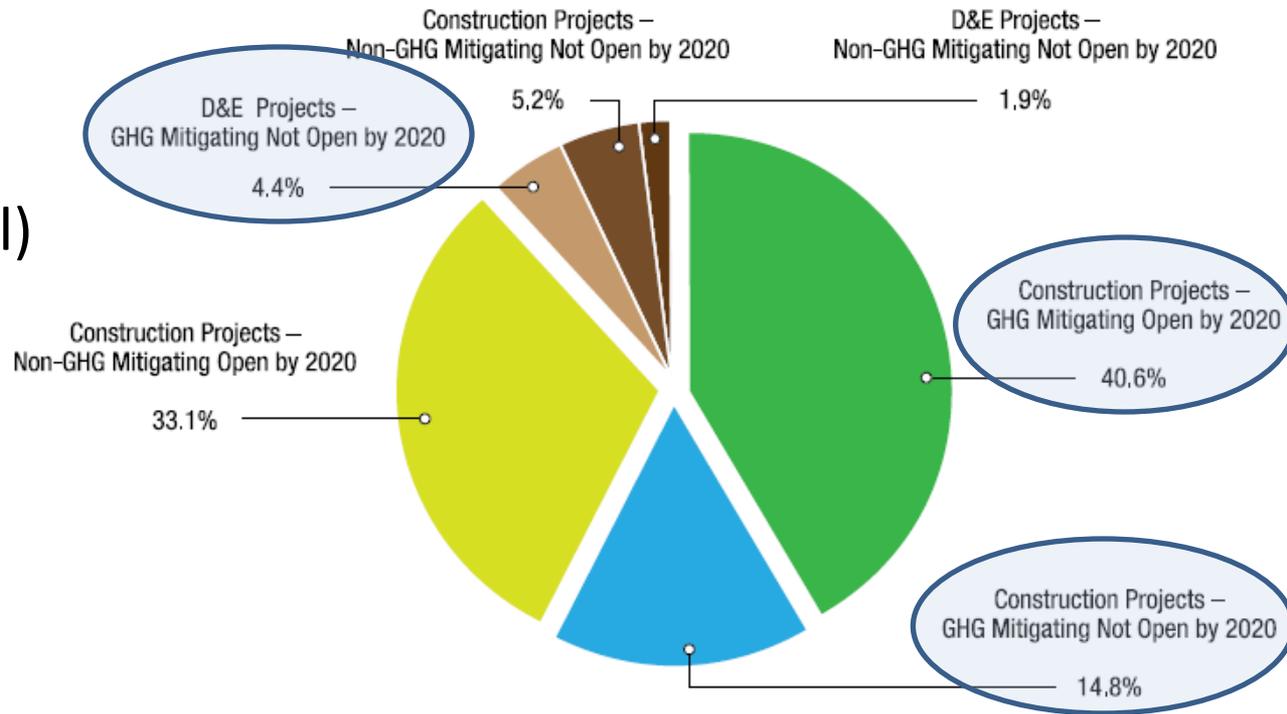
Transportation Policy & Funding

- Federally prescribed process
 - Maryland Consolidated Transportation Program (CTP)
 - Six-year fiscally-constrained capital program based on projected revenues
 - Includes all transportation business units
 - Metropolitan Planning Organizations
 - Transportation Improvement Programs (up to 4-6 year)
 - Long-Range Transportation Plans (25-year)
 - Fiscally constrained (based on estimates of available funding)
 - Also develop “needs-based” or “unconstrained” plans
 - Coordinated with jurisdictions and land use forecasts

Transportation Policy & Funding

2015-2020 CTP

- \$14.4 billion total
- \$10.4 billion (capital)
- 60% of funding to GHG beneficial projects
- 41% to projects ready by 2020



Note, the Draft 2017-2022 CTP is currently under review, with the CTP Fall Tour running Sept. 20th through Nov. 15th.
http://www.mdot.maryland.gov/newMDOT/Planning/CTP/2016_CTP_Tour/Index.html



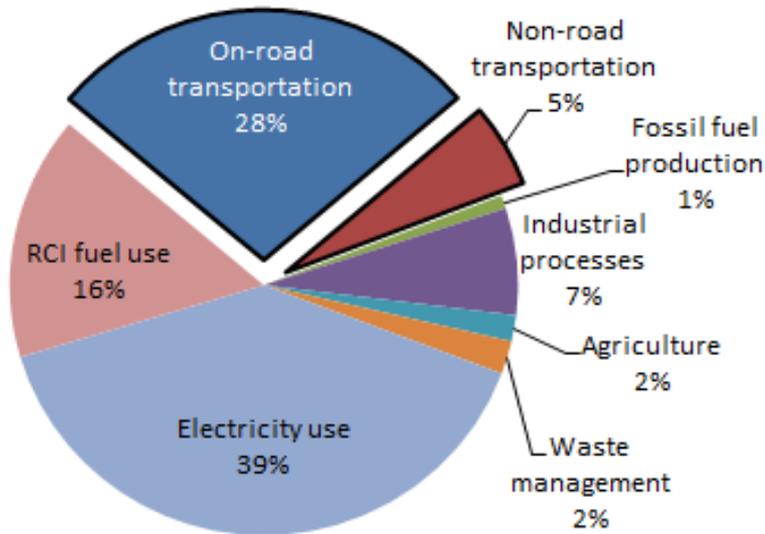
TRANSPORTATION TRENDS 2006 – 2020 – 2030 AND BEYOND

2006 Inventory

2006 Baseline

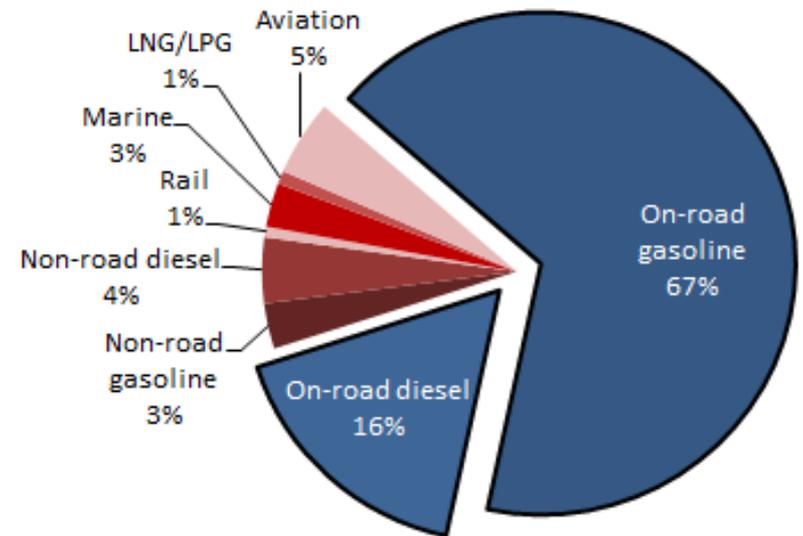
Statewide Inventory

Transportation: 33%, 35.5 mmt CO₂e



Transportation Inventory

On-road: 84%, 29.7 mmtCO₂e



Other: 16%, 5.8 mmt CO₂e

Source: Maryland's Greenhouse Gas Reduction Act Plan, October 2013.

VMT & VMT per Capita

Annual Number of Vehicle Miles Traveled (VMT) and VMT per Capita



* 2013 and 2014 data revised from previous Attainment Report.
 ** 2015 data is preliminary and subject to change.

2006 composite emission rate
 (VMT weighted) = 542 g/mi

1 mmt CO₂e = 1.84 billion VMT

2020 composite emission rate
 (VMT weighted) = 476 g/mi

1 mmt CO₂e = 2.10 billion VMT

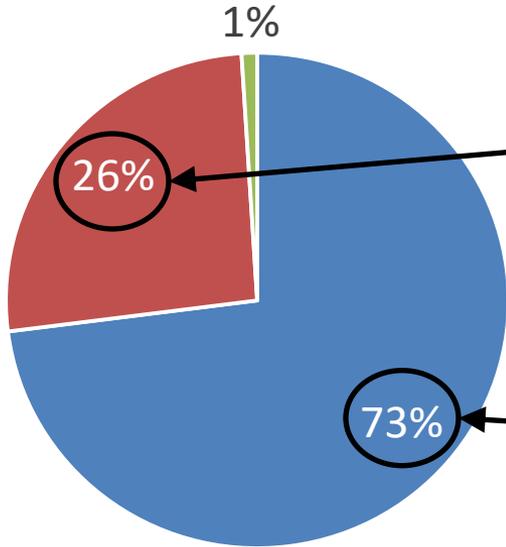
2030 composite emission rate
 (VMT weighted) = 376 g/mi

1 mmt CO₂e = 2.66 billion VMT

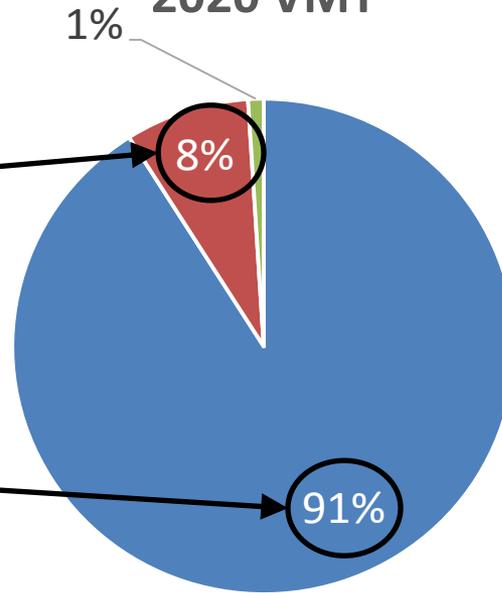
1 mmtCO₂e reduction = 3.7% Reduction in VMT in 2030

2020 GHG and VMT Estimates

2020 GHG mmtCO₂e



2020 VMT



■ Light-duty Vehicles
■ Motorcycles/Other

■ Heavy-Duty Vehicles

■ Light-duty Vehicles
■ Motorcycles/Other

■ Heavy-Duty Vehicles

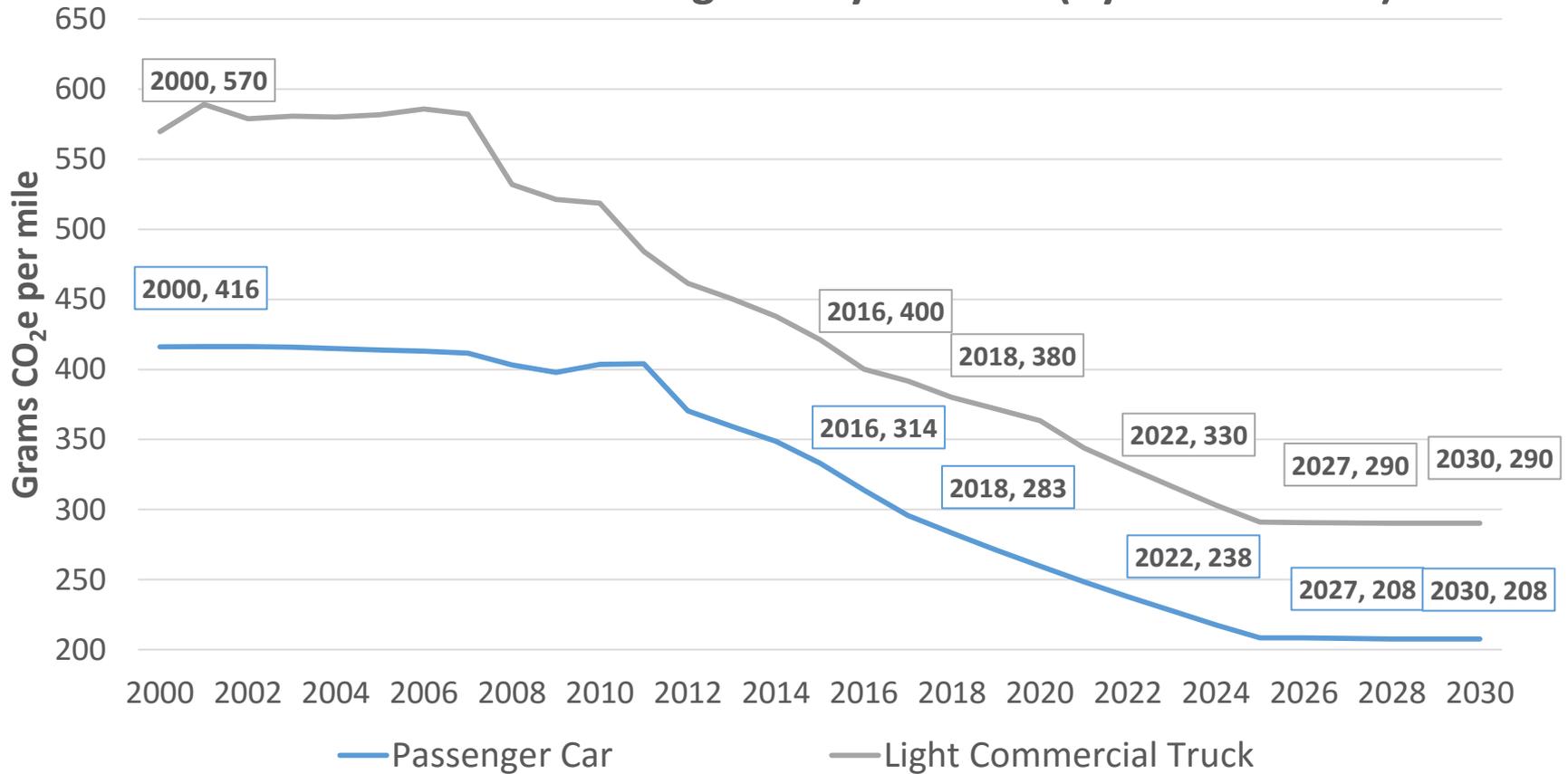
- VMT forecasts based on MPO analysis and FHWA trends.
- Emission estimates through EPA MOVES2014 model.

Consistent with state of the practice for transportation per EPA



Trends to 2030

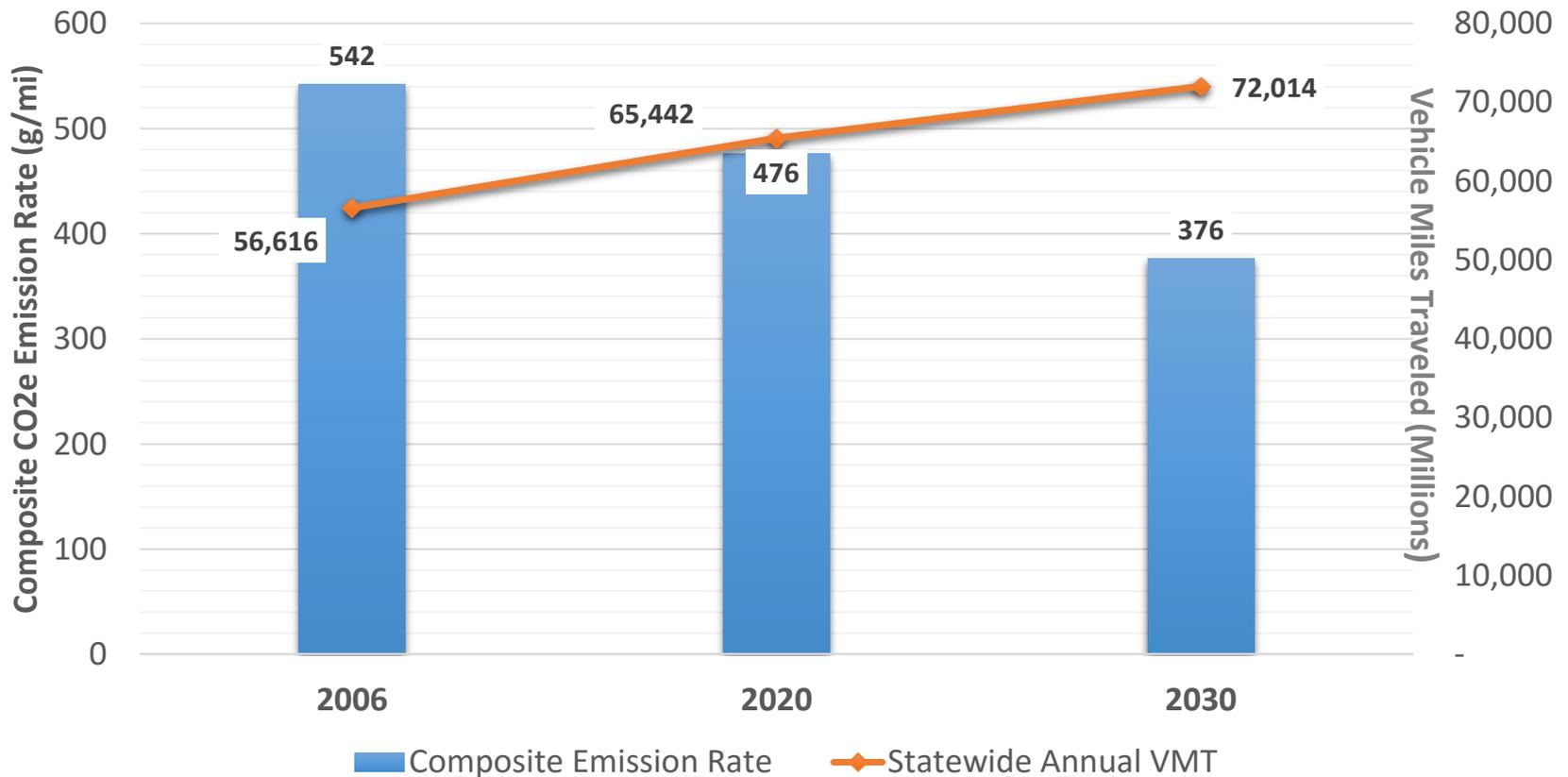
Emission Factor for Light-Duty Vehicles (By Model Years)





Trends to 2030

Emission Rate v. Vehicle Miles Traveled (VMT)

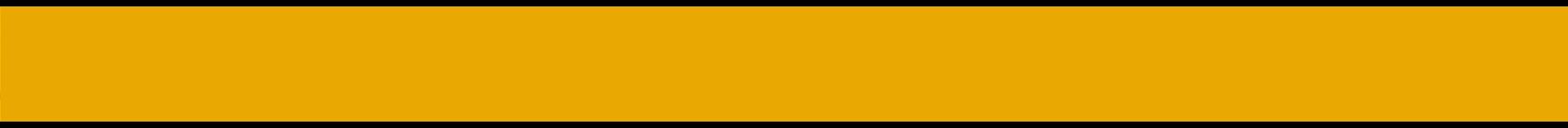




Light Duty Fleet Turnover

Light Duty Vehicle Distribution by Model Year* (Compared to Light Duty Vehicles Total)		
Model Year Group	2020	2030
2026 and Later	0.0%	31.2%
2017-2025	22.8%	51.2%
2011-2016	43.5%	13.3%
2010 and Older	33.7%	4.3%
Total	100.0%	100.0%

*Fleet turnover calculated for a sample MD county



LOOKING AHEAD TO 2030





Looking to 2030

More complex than 2020 analysis and many more unknowns....

- 1. Almost certain** – Federal and State vehicle and fuel standards
- 2. Less certain** – Transportation policy and funding
- 3. Some hints, with many variables to consider** –
 - Technology advancement
 - Social trends
 - Market changes and economic shifts
 - Travel behavior



2030 Strategies

- Strategy Development
 - Identified potential strategies in addition to what's included in the **“Almost Certain”** and **“Less Certain”** scenarios
 - Strategies represent “full” scope of possibilities by 2030, including strategies where MDOT has little control
 - Include traditional capacity and operational strategies, along with technology and behavioral strategies or trends



2030 Variables and Strategies

- Example: Technology advancement
 - Continued extension of Federal standards
 - Increased efficiency requirements through 2030
 - Increased EV market penetration
 - Passenger and commercial applications
 - Range and price concerns disappear
 - Autonomous and connected vehicles
 - V2V and V2I expansion, and more vehicles with higher levels of autonomy
 - Smart mobility, telework, other technologies that replace or remove trips

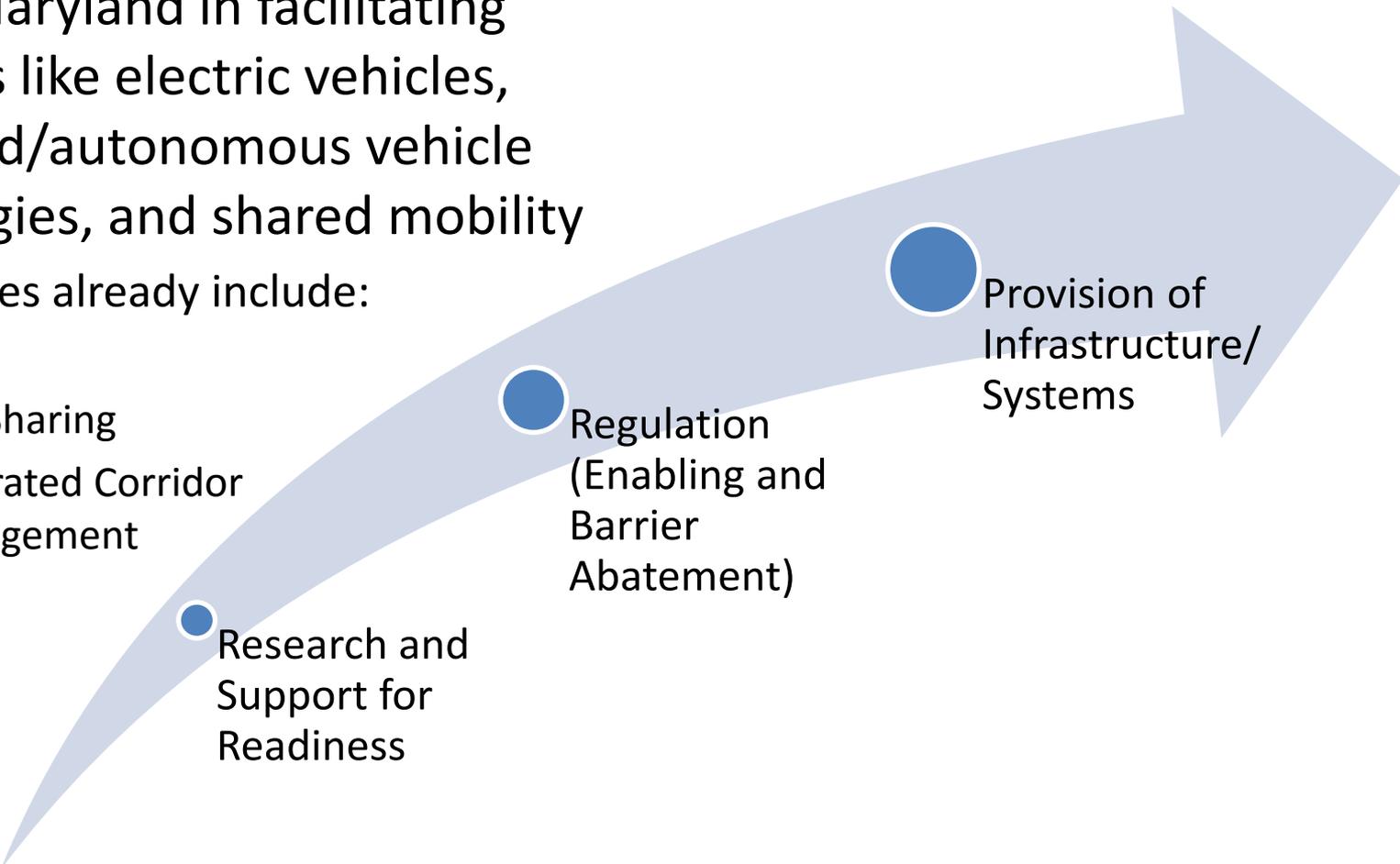


Technology Advancement

- Role of Maryland in facilitating strategies like electric vehicles, connected/autonomous vehicle technologies, and shared mobility

– Examples already include:

- EVIC
- Bike Sharing
- Integrated Corridor Management

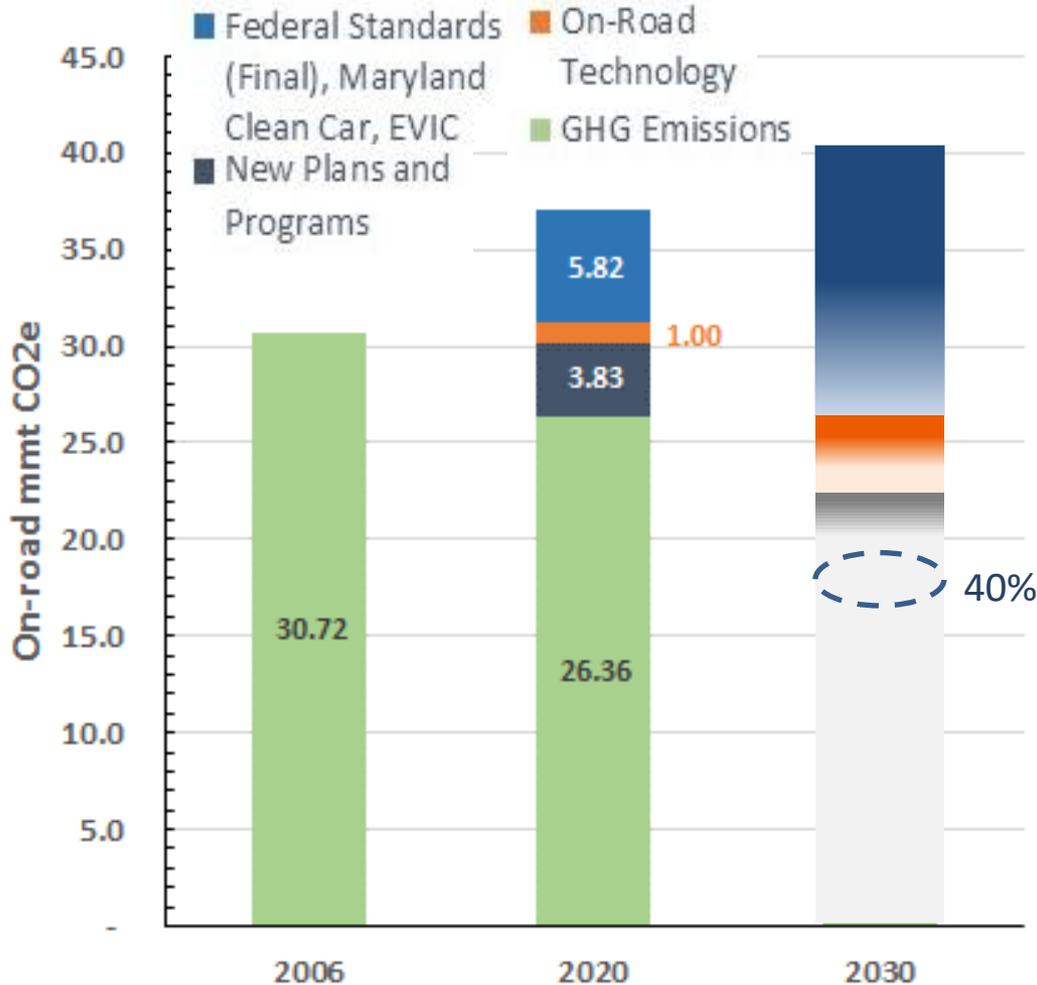


Research and Support for Readiness

Regulation (Enabling and Barrier Abatement)

Provision of Infrastructure/Systems

2030 Preliminary Results



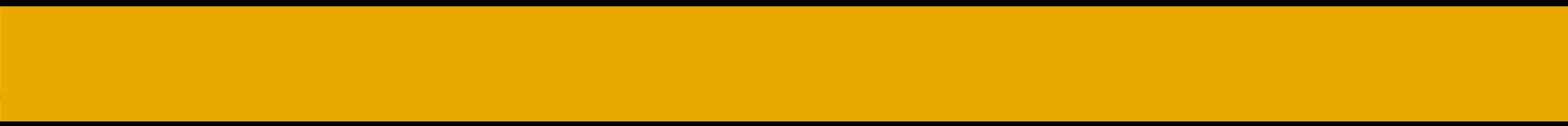
Almost Certain – Preliminary estimate of the impact of final Federal standards



Less Certain – Preliminary estimate of the impact of implementation of forecasted transportation plans and programs and land use patterns



Hints Only – Emerging technology and everything else



ROLE OF BLACK CARBON IN TRANSPORTATION





Black Carbon & Transportation

What: Black carbon is formed by the incomplete combustion of fossil fuels, biofuels and biomass, is the most strongly light-absorbing component of particulate matter (PM). It stays in the atmosphere only for days or weeks, therefore is considered a “short-lived climate pollutant” (SLCP).

Climate Effects: Highly variable depending on a number of factors (can have both warming and cooling effects).

Role Compared to GHGs: More local and regional impacts by location and season (climate impact is short-lived). Global warming potential of 2,000 – 3,000 (e.g., 2,000 tons of CO₂ equals the same radiative effect of 1 ton of black carbon)



Black Carbon and Transportation

- Mobile sources account for 52% of U.S. black carbon emissions, with 93% of those emissions from diesel engines
- Substantial reductions expected due to Federal diesel engine controls
 - 32% reduction already from 1990 to 2005
 - Further 86% reduction projected through 2030
 - Reductions through standards, new particulate filters and fuel, and retrofit programs



Challenges

- Funding – Constraints & Opportunities
- Land use planning & controls at local jurisdiction level
- Increasing impact of M/HD trucks
- Cost effective strategies compared to technology advances
- Infrastructure / manufacturer support for electric and autonomous Vehicles
- MDOT / State role v. private role
- Removing barriers (e.g. role as a facilitator)
 - Groundbreaking technologies
 - Research / Regulations
 - Changing Social Norms



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MDOT Planning Documents: www.mdot.maryland.gov

MDOT 2015 Greenhouse Gas Reduction Plan

[http://www.mdot.maryland.gov/newMDOT/Planning/Environmental/Documents/Greenhouse Gas Reduction Plan rev.pdf](http://www.mdot.maryland.gov/newMDOT/Planning/Environmental/Documents/Greenhouse_Gas_Reduction_Plan_rev.pdf)