National Capital Region
Transportation Planning Board

TRANSPORTATION PLANNING BOARD

Wednesday, December 15, 2021
12:00 - 2:00 P.M.

VIRTUAL MEETING ONLY

AGENDA

12:00 P.M. **1. PARTICIPATION PROCEDURES, MEMBER ROLL CALL, AND PUBLIC COMMENT OPPORTUNITY**
Charles Allen, TPB Chair

For any member of the public who wishes to address the board on the day of the meeting, they may do so by emailing a short statement (no more than 375 words) to TPBcomment@mwcog.org with the subject line "Item 1 Virtual Comment Opportunity." These statements must be received by staff no later than 12 P.M. Noon on Tuesday, December 14, 2021 to be relayed to the board at the meeting.

12:15 P.M. **2. APPROVAL OF THE NOVEMBER 17, 2021 MEETING MINUTES**
Charles Allen, TPB Chair

12:20 P.M. **3. TECHNICAL COMMITTEE REPORT**
Jason Groth, TPB Technical Committee Chair

12:25 P.M. **4. COMMUNITY ADVISORY COMMITTEE REPORT**
Elisa Walton, CAC Chair

12:35 P.M. **5. STEERING COMMITTEE ACTIONS AND REPORT OF THE DIRECTOR**
Kanti Srikanth, TPB Staff Director

This agenda item includes Steering Committee actions, letters sent/received, and announcements and updates.

12:40 P.M. **6. CHAIRMAN'S REMARKS**
Charles Allen, TPB Chair

ACTION ITEMS

12:50 P.M. **7. NOMINATING COMMITTEE REPORT FOR THE 2022 TPB OFFICERS**
Charles Allen, TPB Chair

Chair Allen appointed a nominating committee to help select TPB officers for the 2022 term. The TPB bylaws set a one calendar year term for TPB officers from January 1 through December 31. The Nominating Committee will present its proposed slate of TPB officers for 2022, which the board will be asked to approve.

Action: Approve the slate of TPB officers for 2022.

12:55 P.M. **8. ENHANCING REGIONAL ROADWAY SAFETY ENFORCEMENT**
Charles Allen, TPB Chair

At its November 17, 2021 meeting, the TPB considered adopting a letter from the TPB to the executives of the District of Columbia, Maryland and Virginia urging them to work together to establish a reciprocal agreement among the three jurisdictions on enforcing traffic citations issued by automated traffic enforcement (ATE) devices. The board decided to take time to allow members to suggest changes that would ensure that interests /concerns of the local jurisdictions would be considered in the process. With input from many members, a revised letter will be reviewed, and the board's approval sought.

Action: Approve a letter from the TPB to the Governors of Maryland and Virginia and the Mayor of the District of Columbia to establish Interjurisdictional Reciprocity of Automated Enforcement Citations to Improve Regional Traffic Safety.

1:05 P.M. **9. REGIONAL ROADWAY SAFETY PROGRAM PROJECT APPROVALS**
Jon Schermann, TPB Transportation Planner

Staff solicited applications for the second round of Regional Roadway Safety Program technical assistance between August 16 and October 12, 2021. The board will be briefed and asked to approve the applications that are being recommended for funding in FY 2022.

Action: Approve Regional Roadway Safety Program technical assistance recipients.

INFORMATION ITEMS

1:15 P.M. **10. PBPP: DRAFT 2018 – 2022 HIGHWAY SAFETY TARGETS**
Jon Schermann, TPB Transportation Planner

The board will be briefed on the proposed 2018-2022 targets for highway safety performance measures as part of federal Performance Based Planning and Programming (PBPP) requirements. Board action is anticipated in January.

1:25 P.M. **11. DRAFT RESULTS OF THE TPB CLIMATE CHANGE MITIGATION STUDY**

Mark Moran, TPB Travel Forecasting and Emissions Analysis Program Director
Michael Grant, ICF

The TPB Climate Change Mitigation Study of 2021 (CCMS) is a scenario study whose goal is to identify potential pathways for the region to reduce on-road, transportation-sector greenhouse gas emissions to meet COG's regional greenhouse gas (GHG) reduction goals associated with 2030 and 2050. The analysis phase of the study is now complete and includes three "top-down" scenarios and 10 "bottom-up" scenarios that explore single and combination pathways to reduce on-road, transportation-sector greenhouse gas emissions. The board received a detailed briefing on the results of the analysis during a special TPB work session, held Monday, December 13 at 3 PM. Today, the board will receive an abbreviated recap of results from the analysis.

2:00 P.M. **12. ADJOURN**

The next meeting is scheduled for January 19, 2022.

MEETING VIDEO

Watch and listen to live video of TPB meetings and listen to the recorded video from past meetings at:
www.mwcog.org/TPBmtg

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board

FROM: Lyn Erickson, Plan Development and Coordination Program Director

SUBJECT: Public Comment for the December 2021 TPB Meeting

DATE: December 15, 2021

The Transportation Planning Board accepts public comment on a rolling basis. Comments can be submitted via email (tpbcomment@mwcog.org), online (mwcog.org/tpbcomment), and phone. Comments are collected until noon on the Tuesday before the TPB meeting. These comments are compiled and shared with the board at the meeting the following day.

Between the November 2021 TPB meeting and noon on Tuesday, December 14, 2021, the TPB received 4 comments. All comments were submitted via email.

The comments are summarized below. All full comments are attached to this memo.

PUBLIC COMMENT

Paula Posas, Maryland Sierra Club – Email – December 14, 2021

Posas submitted a letter to be included in the meeting materials for the December TPB meeting. The letter states that the TPB Climate Change Mitigation Study of 2021 shows that the region cannot meet its greenhouse gas reduction goals unless the most polluting projects are replaced with less polluting projects. It said the I-495 and I-270 project cannot be reconciled with the region's VMT and emissions reductions goals. The Maryland Sierra Club urged the TPB to make decisions supported by data and remove the I-495 and I-270 project from the long-range plan.

Stewart Schwartz, Coalition for Smarter Growth – Email – December 14, 2021

Schwartz submitted a letter to be included in the meeting materials for the December TPB meeting. The letter states that the findings from the TPB Climate Mitigation Study of 2021 are clear that the region can achieve necessary levels of greenhouse gas reductions. The letter includes additional interpretations of the study findings and provides further detail on their interpretations.

Alrene Montemarano – Email – December 8, 2021

Montemarano sent an email invitation to a West Montgomery County Citizens Association meeting on December 8 opposing the I-495 and I-270 projects. They requested help in spreading awareness for the December 8 event.

Carolyn Huard – Email – November 20, 2021

Huard sent an email explaining their opposition to the I-495 and I-270 projects and provided a suggestion to replace them with increased transit service.

SIERRA CLUB
MARYLAND CHAPTER

Sierra Club Maryland Chapter
P.O. Box 278
Riverdale, MD 20738
(301) 277-7111

December 14, 2021

Summary Points

1. The TPB's Climate Change Mitigation Study shows that it will be impossible to meet 2030 and 2050 emissions reduction goals unless the most polluting projects are replaced with less polluting projects and supportive travel demand management programs (and updated assumptions for telework) and land use in the long-range transportation plan.
2. The I-495 & I-270 Managed Lanes project cannot be reconciled with the region's VMT and emissions reductions goals. The project is designed to manage congestion and supposedly accommodate traffic growth, not reduce VMT and emissions.
3. We urge the TPB to make decisions that are supported by data and research, and are guided by the TPB's goals for greenhouse gas reduction, equity, and public health and safety.
4. We therefore ask that the TPB remove the 495-270 toll lanes project from the long-range plan until a) there is resolution of issues with the MWCOG traffic model used in the project SDEIS to allow for accurate estimation of greenhouse gas emissions, and b) there has been adequate consideration of reasonable alternatives to toll lanes, including TDM/TSM and multimodal alternatives.

Dear Chair Allen and Members of the Transportation Planning Board,

We commend the growing commitment of the Transportation Planning Board (TPB) to consider climate change mitigation in its decision making. This issue is also on the table and being debated at the federal level, as evidenced by this Dec. 10 article, "House bill would force states to cut transportation emissions, with 'consequences' for those that don't." The purpose of this comment letter is to draw to your attention the extent to which current plans by the Maryland Department of Transportation (MDOT) to increase highway capacity through the addition of new toll lanes would undermine the objectives of the Climate

Change Mitigation Study (CCMS)[1]. We ask that you reconsider the decision to allow this unnecessary project to remain in the long-range transportation plan for the metropolitan Washington area.

The TPB's recently published CCMS shows that Northern Virginia and the greater DC region must reduce per capita vehicle miles traveled (VMT) by 15-20% from pre-pandemic levels by 2030 to meet the regional climate plan's reduction of greenhouse gases from on-road transportation. But per capita VMT under the current regional transportation plan would only go down 3 per cent per capita by 2045, not 15-20 per cent.

We note that the Vehicle Technology and Fuels Improvement VT.2 scenario of achieving 100% EV sales for light duty vehicles by 2030 (a rate that is higher than California's mandate that 100 percent of in-state sales of new passenger cars and trucks are zero-emission by 2035), while desirable, is unrealistic. Accordingly, only the combined scenarios[2] reduce VMT sufficiently to reach the target.

TPBs Long-Range Plan Task Force showed in 2017 that key climate change solutions modeled in the TPB Climate Change Mitigation Study (travel demand management, transit-oriented land use) would address congestion and improve job access more effectively than a vastly expanded regional toll lanes network relying on expanded highway capacity - even with new transit on the express lanes.

With regard to High-Occupancy Vehicle (HOV) and High-Occupancy Toll Lanes, the CCMS literature review (p. 61) states that:

> When adding capacity instead of converting existing capacity, HOV lanes induce new vehicle travel in urbanized areas. Regional simulation modeling studies suggest that the additional VMT will at least partially offset any emissions benefits resulting from smoother traffic flow, and in many cases will completely offset the emissions benefits. These conclusions are also supported by

[1] Draft TPB Climate Change Mitigation Study Report, December 2021. https://www.mwcog.org/file.aspx?&A=H350Gh%2fxfp801sUyxIjYdCpBayZPsnI2GaDNsJsvYDw%3d.

[2] Combined or COMBO scenarios include: Vehicle Technology and Fuels Improvement Scenario + Mode Shift Scenario + Transportation Systems Management & Operations Scenario. Given than VT.2 is unrealistic, successful COMBO strategies involve either MS.3 levels of per capita VMT reduction (20%) or hybrids of MS.2/MS.3 and VT.1/VT.2 scenarios to achieve the COG 2030 on-road GHG reductions. Thus, the range of VMT reduction needed is approximately 15-20%.

> project-level analyses of emissions impacts of HOV and express lane additions reported in recent project environmental documents.

The well-established research literature on induced demand shows that large-scale highway expansion projects result in additional driving beyond that forecast in typical travel demand models. These projects make the built environment less friendly to walking, biking, and transit-oriented land use and make it harder to reduce VMT and emissions long term.

TPB studies are not the only ones saying highway expansion is not an optimal solution to traffic congestion. In August 2020, the Maryland Transportation Institute testified that a 5 percent increase in telework would reduce congestion by 32 to 58 percent.[3]

In 2020, MWCOG said:

> While traffic volumes regionally recently have been about 20% below pre-pandemic levels, peak period speed data remain near free-flow. Traffic flow theory and longstanding empirical data have established that when demand exceeds capacity and traffic operations are in unstable or saturated conditions, a small reduction in demand results in a disproportionate improvement in speeds. As such, **strategies to marginally reduce single occupant vehicle (SOV) demand during peak demand via flexible work schedules, pricing or ridesharing (including express bus service) are effective ways to address peak period congestion, conserve energy and reduce emissions.**[4] *(bolding added)*

This report was cited in the Supplemental Draft Environmental Impact Statement (SDEIS) for the I-495 & I-270 Managed Lane Study Appendix B at PDF p. 146.

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[3] Bruce DePuyt, Analysts: More Telework, Change in Habits Could Dramatically Ease Congestion, Maryland Matters (Aug. 14, 2020), https://www.marylandmatters.org/2020/08/14/analysts-more-telework-change-in-habits-could-dramatically-ease-congestion/.

[4] TPB Systems Performance Planning Director to TPB Technical Committee on "Transportation Impacts of the COVID-19 Pandemic in the National Capital Region" (Sept. 3, 2020 Revised), https://www.mwcog.org/file.aspx?&A=L6DA2phKUvK7mnM2rhoQQEFsr0EjNAhO%2Bkd7VxAtRU8%3D.

Thus, MDOT itself appears to acknowledge that other measures would effectively address congestion. As for traffic systems management, MDOT predicts that its Innovative Congestion Management program on I-270, including restriping to add lanes at certain locations, ramp entrance and exit adjustments and ramp meters on I-270, will improve driving time by as much as 30 minutes between Frederick and I-495. It is therefore bizarre that MDOT nonetheless continues to push its project for adding additional toll lanes to I-270.

The I-495 & I-270 Managed Lanes project to widen and toll I-495 and I-270 simply cannot be reconciled with the region's VMT and emissions reductions goals. The project is designed to increase congestion and accommodate traffic growth not reduce it.

In order to be lucrative, the toll lanes have to do socially perverse things to artificially inflate demand during rush hours. The tolls will be set to maximize revenue not throughput. What the toll operators do to maximize revenue has been described as "jam and harvest" in the academic literature: the intentional setting of toll rates in order to jam the free lanes, forcing more drivers into the toll lanes where top fees can be harvested. Read about it in the Sierra Club et al. comments[5] or as described in an academic paper:

> A few hours before the peak arrival traffic is observed, the tolls go up to very high levels and effectively divert all arrivals into the unmanaged lanes. By diverting almost all arriving vehicles into the unmanaged lanes, the toll operator achieves two goals: he reserves capacity in the managed lanes for the peak hours and increases congestions in the unmanaged lanes. These two effects combine to increase the attractiveness of the managed lanes during the peak hours – which enables the operator to extract more revenue from arriving traffic just when the volume of arrivals is highest. We term this a jam and harvest approach. From Table 2 and Figure 9 we can see that this approach translates into substantial revenue improvements over the Myopic Policy. When the Time-of-Use Policy sets its tolls high, a minuscule amount of revenue is earned since almost all drivers choose the unmanaged lanes. By forgoing the revenue in this period of time, the

[5] Sierra Club et al. SDEIS comments (1).pdf, Nov. 30, 2021, pp. 41-43, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u18365/2021-11-30%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments%20%281%29.pdf.

> operator earns substantially more revenues when the jamming period ends and the harvest period begins.[6]

The toll lanes would increase congestion in the general purpose lanes in order to extract the most revenue possible for toll operators.

The toll lanes also create massive merge point congestion problems that significantly increase accident rates and traffic bottlenecks and delay, forcing more extensions to address safety issues and move the bottlenecks. Read about them in the paragraph below from the Virginia Department of Transportation (VDOT) report, I-495 Express Lanes Extension Project Detail-Level Project Screening Report:

> Vehicle back up at the northern terminus of the existing Express Lanes into the general purpose lanes has created a northbound bottleneck, resulting in general purpose lane queues during peak hours which extend approximately 2.5 miles to the Route 7 interchange. Additionally, crashes due to this congestion and weaving movements of vehicles from the Express Lanes to the exit at the Georgetown Pike interchange have created safety issues in the Project area.[7]

Building toll lanes in Maryland to occupy highway right of way will only lock in car dependency and increase VMT and emissions. Toll lanes foreclose alternatives, particularly transit alternatives, and are contrary to the "transit first" policies adopted by jurisdictions in the project area.

On top of all that, the toll lane project will make us more vulnerable to climate-related hazard events, particularly storms and flooding, which are projected to continue increasing. We know we will be significantly more vulnerable than now because cumulative impacts of this project are conservatively estimated at well over 1,500 acres of tree canopy loss and hundreds of acres of new impervious surface. Trees are one of our main defenses and contributors to resiliency in the face of climate change. The massive forest canopy loss would

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[6] Caner Gocmen, Robert Phillips, and Garrett van Ryzin. Revenue Maximizing Dynamic Tolls for Managed Lanes: A Simulation Study, Columbia University Center for Pricing and Revenue Management, Working Paper Series No. 2015-01, 2015, p. 17, https://www8.gsb.columbia.edu/cprm/sites/cprm/files/TollPricingWorkingPaper_2015_01.pdf.

[7] I-495-EXT Detail Level Project Screening Report, Nov. 24, 2014, https://www.p3virginia.org/wp-content/uploads/2016/02/I-495-EXT_Detail-Level-Project-Screening-Report_All_with-VDOT-Response-Letter.pdf.

amplify and accelerate the negative environmental and community impacts and risks that would come with so much new impervious surface. This means poorer air quality and water quality, increased heat island effect, increased surface water runoff and flooding.

With regard to the toll lanes, MDOT has failed to study reasonable alternatives advocated by the TPB, MWCOG, and Maryland Transportation Institute that would avoid or reduce harmful impacts of the four-toll-lane preferred alternative. Multimodal alternatives and TDM/TSM must be considered. Transportation demand management strategies, including flexible work schedules, express buses, and telework, and transportation systems management strategies, such as ramp meters, lane and ramp adjustments, and queue-jumper lanes giving buses and trucks preference at ramp meters, would have less harmful impacts than the preferred alternative. They must be studied to fulfill NEPA's requirement that reasonable alternatives that avoid or minimize adverse impacts be reviewed and made available for public scrutiny and engagement.

The traffic modeling in the I-495 & I-270 Managed Lanes Project SDEIS produced results that are erroneous and lacking in credibility.[8] These results were produced by the current version of the MWCOG regional traffic model. Until the cause of this failure is identified, it is impossible to know whether it arises from a defect in the model or in MDOT's inputs to the model. Until the TPB identifies the cause of this failure, the model outputs cannot be relied on. The TPB must therefore urgently address this issue in order to ensure reliable estimates of greenhouse gas emissions are being made.

Gov. Hogan and MDOT's arm twisting to force the July re-vote to accept the toll lanes were empty threats.[9] Yet they were believed and changed the overall vote of the Transportation Planning Board from one that recognized the project's role in exacerbating climate risks to one that blatantly ignored these risks.

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[8] Letter from MTOC, CABE, and DontWiden270 to Acting FWHA Administrator Stephanie Pollack, Oct. 18, 2021, https://transitformaryland.org/sites/default/files/pollackletter.pdf.
[9] Bruce DePuyt, Korman Zings MDOT Secretary on Threatened Projects That Still Aren't Funded, Maryland Matters (Nov. 23, 2021), https://www.marylandmatters.org/2021/11/23/korman-zings-mdot-secretary-on-threatened-projects-that-still-arent-funded/.

This body should resist any attempts at coercion from the toll lane proponents, and instead make the decisions that are supported by the data and research, and are guided by its own goals for greenhouse gas reduction, equity, and public health and safety.

We ask you to study and re-consider the decision to allow this unnecessary project to remain in the long-range plan in light of its needless adverse impacts on climate, human health and safety, communities, historic places, and environment. This project is a steep slippery slope to toll lane extension after extension at the expense of the health and safety of a majority of Marylanders, taking from those with lower income to benefit the affluent. Giving up public land to ensure enormous ongoing benefits for a private Australia-based multinational.

Specifically, we ask that the TPB remove the Maryland toll lanes project from the long-range plan until

1. the TPB has reviewed what these monopolistic toll lane arrangements look like in Australia[10]
2. the source of MDOT's I-495 & I-270 SDEIS traffic modelling errors using the MWWCOG traffic model have been identified; this is needed to ensure reliability of estimates of greenhouse gas emissions, air quality, and environmental justice impacts of adding toll lanes
3. reasonable alternatives to the project, including TDM/TSM and multimodal alternatives have been fairly and adequately considered.

Respectfully,

Sierra Club Maryland Chapter

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[10] WestConnex: The Toll Road That Ate Sydney, Sydney Morning Herald (March 26, 2021), https://www.smh.com.au/national/nsw/westconnex-the-toll-road-that-ate-sydney-20210323-p57d9y.html; NRMA Calls for Toll Price Transparency, Riverine Herald (Oct. 25, 2021), https://www.riverineherald.com.au/national/2021/10/25/5511055/nrma-calls-for-toll-price-transparency; 'Cost Outweighs Benefit': Trucking Giant's Toll Message to Drivers, The Age (Sept. 28, 2021), https://www.theage.com.au/national/nsw/cost-outweighs-benefit-trucking-giant-s-toll-message-to-drivers-20210928- p58vi1.html; Job Security and Shoddy Deals for Transport Workers, Big Rigs (Nov. 25, 2021), https://bigrigs.com.au/index.php/2021/11/25/job-security-and-shoddy-deals-for-transport-workers/#more-39374; Transurban's Tentacles are Around 14m Aussie Wallets, Herald Sun, https://www.heraldsun.com.au/business/terrymccrann/transurbans-tentacles-are-around-14m-aussie-wallets/news-story/b694aa66ff433f793f2531149961242f; Sam Mostyn Says One Thing, Transurban Does Another, Financial Review (April 7, 2020), https://www.afr.com/rear-window/sam-mostyn-says-one-thing-transurban-does-another-20200406-p54hj2.

Coalition for Smarter Growth
DC • MD • VA

December 14, 2021

Chair Charles Allen
Transportation Planning Board
777 North Capital Street
Suite 300
Washington, DC 20002

Re: TPB Climate and Transportation Study Findings

Dear Chair Allen and members of the TPB:

The findings from your climate and transportation study are clear:

1. The region **can** achieve necessary levels of greenhouse gas reductions under its adopted 2030 climate plan.
2. We cannot depend solely on electric vehicle adoption and a cleaner grid.
3. The region must reduce per capita vehicle miles traveled by 15 to 20% by 2030.
4. This can be done through a feasible and comprehensive approach of transit-oriented and walkable land use, meeting our housing goals, expansion of transit service and improved access to transit, and pricing tools.
5. These solutions provide many additional benefits to the region's equity, safety and livability.
6. You must begin acting now in order to meet critical 2030 goals.

Further explanation of these points:

To meet COG's adopted climate plan and achieve its minimum level of GHG reductions from cars and trucks:

- **Focus on 2030 targets.** Cumulative greenhouse gas emissions matter, and short-term targets are essential. Kicking the can down the road to 2050 will result in disaster.
- **Region must reduce per capita VMT by 15-20% by 2030**, even with ambitious EV adoption and a clean electric grid
    - Only the COMBO.2, 3, 4 strategies sufficiently reduce emissions.
    - VT.2 scenario, while perhaps desirable, is not realistic - it would depend on the DC region surpassing California in electric vehicle adoption.
    - This means that the region must begin implementing mode shift MS.1 and MS.2 or similar strategies in the next few years.
    - These strategies include: enhanced transit, ped/bike, transit-oriented development, regional housing targets, TDM, and road usage fees/congestion pricing on existing lanes.

- **MS.1 and MS.2 strategies improve travel for everyone, more effectively than highway expansion** - Many if not all of the expensive proposed highway expansion projects are not only unnecessary and wasteful (especially given the necessary changes in travel demand and mode share) and these projects would also undermine the region's climate efforts.
- **Local governments and regional bodies must lead the way now.** The region can't depend on Richmond or Annapolis to implement its 2030 climate plan given the stated policy priorities of the governors.
- **TPB's work plan for the coming year must develop actionable strategies** - The Unified Planning Work Program (UPWP), currently being drafted by staff, must quickly take these findings and turn them into actionable proposals that TPB Board members can adopt and include in the next Visualize 2045 update due to be completed by 2024.
- **Current Visualize 2045 update must set performance targets for reducing VMT and GHGs.** This means not just tracking performance measures as in past plans but also setting targets for needed outcomes consistent with the climate study findings:
    - 15-20% reduction in per capita VMT by 2030 relative to 2018
    - 32-50% GHG emissions reductions by 2030 relative to 2005

We have a responsibility to act.

Stewart Schwartz
Executive Director

Bill Pugh
Senior Policy Fellow

*Terms: VT = vehicle technology; MS = Mode shift; TSMO = Transportation Systems Management & Operations

TPB Comment

From: Arlene <mikarlgm@gmail.com>
Sent: Wednesday, December 8, 2021 9:35 AM
Subject: Community Meeting on I-270/I-495 Toll Lanes

Follow Up Flag: Flag for follow up
Flag Status: Completed

Please help to spread awareness of this event tonight.

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This invitation is from the West Montgomery County Citizens Association, but is appropriate for everyone everywhere who is concerned about the I-270/495 widening.

West Montgomery County Citizens Association
Please Share with Your Contacts & Neighbors!

WMCCA was Founded in 1947

JOIN US FOR A VIRTUAL MEETING!

Wednesday, December 8, 2021 at 7:30 p.m. via ZOOM

https://us02web.zoom.us/j/86424886531?pwd=K0lpOTVWaXAzWXUwVHhIMTlwQlNlZz09

or call in with 301-715-8592 (Meeting ID: 864 2488 6531, Passcode: 780822)
A recording of this meeting, and hotlinks within the Newsletter, will be available on our website: www.WMCCA.org

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SPEAKERS: Shruti Bhatnagar, Chair of the Montgomery County Group, Sierra Club and Brian Ditzler, Transportation Committee Chair, Sierra Club

Shruti Bhatnagar and Brian Ditzler will describe the Sierra Club's opposition to Governor Hogan's proposed expansion of the I-495 Beltway and I-270 and the 200-page Draft Environmental Impact Statement (DEIS) comment letter, signed by 52 organizations. Please join us for this important discussion. We encourage you to share the General Meeting Zoom link with at least one neighbor or Montgomery County friend as our General Meetings are always open to the public.

Opposition to Proposed I-495 Beltway and I-270 Corridor Expansion
President's Letter by Carol Van Dam Falk

West Montgomery County Citizens Association, together with several other area organizations, has opposed Maryland Governor Larry Hogan's multi-billion-dollar proposal to expand the I-495 Beltway and I-270 corridor for several reasons: it would hurt local ratepayers, severely impact Maryland taxpayers, but most importantly, it would assault our local environment in a way that can never be undone at a time when state government should be most concerned with finding ways to mitigate climate change, not increase it. WMCCA wrote the then-head of the Maryland Highway Department along with several regional and state representatives regarding our strong opposition to the I-495/I-270 expansion project a little more than a year ago and more recently signed on to a coalition letter that includes legal and technical comments on the Supplemental Draft Environmental Impact Statement for the 495/270 toll lanes plan. The comments provide a rigorous legal and technical analysis of why the proposal is flawed and must not move forward.

The DEIS can be found at
https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u18365/2020-11-09-Comments%20on%20DEIS%2C%204%28f%29%2C%20and%20JPA%20%281%29%20%281%29.pdf

One of the groups spearheading this effort has been the Maryland Sierra Club. Therefore, we thought it timely to invite Shruti Bhatnagar and Brian Ditzler of the Sierra Club Maryland to describe how the project would increase carbon emissions, damage forests and streams, encourage sprawl, destroy some established neighborhoods, and fail to achieve Hogan's stated goal of reducing congestion.

The Sierra Club and WMCCA support expansion of public transit options from Shady Grove to Gaithersburg, Germantown, and Clarksburg as well as the Corridor Cities Transitway, which would require state and county funding. WMCCA and the Sierra Club have long supported adding Bus Rapid Transit (BRT) along MD 355 which would far better meet the needs of commuters than adding roads or lanes.

Thank you,
Barbara Hoover, Treasurer
WMCCA
hooverb@msn.com
www.WMCCA.org

West Montgomery County Citizens Association

The West Mongtomery County Citizens Association is committed to protecting the Agricultural Reserve and open space in Potomac, Maryland from urban sprawl and gridlock.

www.wmcca.org

We isolate now
So when we gather again
No one is missing

~ Meria Marom ~

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Arlene Montemarano, 240-360-8691, Lawndale Drive

The State's plan to add 4 private toll lanes to 495 and 270 would impact six national park sites, threaten dozens of local and regional parks, and endanger 30 miles of streams, 50 acres of wetlands, and 1,500 acres of forest canopy.

--
Arlene Montemarano, 240-360-8691, Lawndale Drive

The State's plan to add 4 private toll lanes to 495 and 270 would impact six national park sites, threaten dozens of local and regional parks, and endanger 30 miles of streams, 50 acres of wetlands, and 1,500 acres of forest canopy.

TPB Comment

From: Carolyn Huard <carolyn.huard@verizon.net>
Sent: Tuesday, November 30, 2021 5:05 PM
To: TPBcomment
Subject: Do Not Widen Route 270

Follow Up Flag: Flag for follow up
Flag Status: Flagged

To whom it May concern:

I continue to listen to arguments to install toll lanes on the lower portion of Rte. 270. Studies have shown that addition of toll lanes will not improve traffic flow. It will only be a legacy project for Gov. Hogan's and a profit generating opportunity for the private contractors who will finance and build this toll lane/ road construction.

Montgomery County population and development opportunities are growing at an exponential rate! There are proposals for the White Flint area; on Executive Blvd. and Montrose Parkway to name a few. I agree with the need for further commercial evelopment in Montgomery County. However, the road system on major highways; major roads and feeder roads is already far beyond capacity.

It is time to develop a radical view of transportation in Montgomery County. Leaders and developers must develop a strong, if not exclusive , plan for mass transportation in Montgomery County. Adding more concrete for expended road systems is counterproductive for transportation efficiency; impacts on the environment and quality of life in Montgomery County.

I have lived in Montgomery County since 1966. At that time the population was 450,000. It was a quiet lovely environment When the collector distributor lanes were added to Rte. 270 in the 1980's the population was 650,000. (My home of 42 years backs up to the collector distributor lanes). The collector distributor lanes were added to solve the traffic flow problems locally and for long distance drivers. The collector distributor lanes did not solve the traffic flow problem and created bottlenecks both a Rte. 495 and in Gaithersburg. Repeating the same mistake by adding toll lanes on Rte 270 will not solve the traffic problem for a current population of Montgomery County which is now 1,050,000 and planned to grow exponentially!

I support the removal of the I-495-270 P3 project from further planning. I support the "No Build " option with concomitant radical plans for Mass Transportation in Montgomery County. With current and planned increased traffic in Montgomery County the only viable option is markedly improved Mass Transportation capacities for both in-county and long distance travel.

Carolyn Huard
11201 Farmland Drive
Rockville Maryland 20852

TRANSPORTATION PLANNING BOARD
MEETING MINUTES

November 17, 2021

VIRTUAL MEETING

MEMBERS AND ALTERNATES PRESENT

Charles Allen, TPB Chair– DC Council
Ella Hanson – DC Council
Christina Henderson – DC Council
Kristin Calkins – DC Office of Planning
Mark Rawlings – DDOT
Jason Groth – Charles County
Denise Mitchell – College Park
Patrick Wojahn – College Park
Jan Gardner – Frederick County
Mark Mishler – Frederick County
Kelly Russell – City of Frederick
Neil Harris – Gaithersburg
Dennis Enslinger - Gaithersburg
Emmett V. Jordan – Greenbelt
Michael R. Leszcz – Laurel
Christopher Conklin – Montgomery County Executive
Evan Glass – Montgomery County Legislative
Victor Weissberg – Prince George's County Executive
Dannielle Glaros – Prince George's Legislative
Bridget Donnell Newton – Rockville
Kacy Kostiuk – Takoma Park
Carol Krimm – Maryland House of Delegates
R. Earl Lewis, Jr. – MDOT
Canek Aguirre – Alexandria
Christian Dorsey – Arlington County
Dan Malouff – Arlington County
James Walkinshaw – Fairfax County
Rodney Lusk – Fairfax County
David Snyder – Falls Church
Adam Shellenberger – Fauquier County
Robert Brown – Loudoun County
Kristen Umstattd – Loudoun County
Pamela Sebesky – Manassas
Jeannette Rishell – Manassas Park
Ann B. Wheeler – Prince William County
Victor Angry – Prince William County
David Reid – Virginia House of Delegates
David Marsden – Virginia Senate
Marie Sinner - VDOT
Norman Whitaker – VDOT
Maria Sinner - VDOT
Mark Phillips - WMATA
Sandra Jackson – FHWA

Dan Koenig - FTA
Julia Koster – NCPC
Tammy Stidham - NPS

MWCOG STAFF AND OTHERS PRESENT

Kanti Srikanth
Chuck Bean
Lyn Erickson
Mark Moran
Tim Canan
Andrew Meese
Nick Ramfos
Paul DesJardin
Tom Gates
Lynn Winchell-Mendy
Eric Randall
Leo Pineda
Stacy Cook
Sarah Bond
Sergio Ritacco
Bryan Hayes
Andrew Austin
John Swanson
Dusan Vuksan
Deborah Etheridge
Jon Schermann

Rob Jackson – CAC
Kari Snyder - MDOT
Christopher Laskowski – DC Council

Audio and video of the meeting, in addition to materials referenced in the minutes, can be found here: mwcog.org/events/2021/11/17/transportation-planning-board/

1. VIRTUAL PARTICIPATION PROCEDURES, MEMBER ROLL CALL, AND VIRTUAL PUBLIC COMMENT OPPORTUNITY

Vice-Chair Sebesky called the meeting to order and reminded the board that the meeting was being recorded and broadcast. She said the process for asking questions and voting would be the same as at previous meetings. After each item, members would be asked for comment or to vote by jurisdiction.

Ms. Erickson conducted a roll call. Members that were present are listed on the first page of the minutes.

Mr. Erickson said that three comments were submitted via email. She said a memo summarizing the comments, with the comments attached, was included with meeting materials. Two of the comments were from the same person who forwarded an article on how expanded highways induce demand and create additional traffic. The other message shared a quote from the West Montgomery County Citizens Association regarding their goal and vision for the county. The third comment was a letter from the Coalition of Smarter Growth stating that the TPB's FY 2023 Unified Planning Work Program should include

staff time to do the following: develop actionable climate proposals; conduct detailed scenario analysis; enhance modeling and forecasting; and improve public outreach.

2. APPROVAL OF THE OCTOBER 20, 2021 MEETING MINUTES

Chair Allen made a motion to approve the minutes from the October TPB meeting.

The board unanimously approved the minutes for the October 20, 2021 TPB meeting.

3. TECHNICAL COMMITTEE REPORT

Mr. Groth said that the Technical Committee met on November 5. He said that the committee received an in-depth analysis into the Regional Travel Survey. They were also briefed on a WMATA study on the Metrorail bottleneck in Arlington at the Blue, Orange, and Silver lines. There was also a briefing on the Street Smart bicycle and pedestrian safety campaign. More detail can be found in the report for these items.

4. COMMUNITY ADVISORY COMMITTEE AND ACCESS FOR ALL ADVISORY COMMITTEE REPORT

Mr. Jackson said that the Community Advisory Committee met on November 11. He said that at the meeting the committee was briefed on Street Smart and the Voices of the Region focus group activity. Finally, the committee was briefed on findings about attitudes toward climate change from the Voices of the Region focus groups and public opinion survey. He said the committee split into groups and answered questions about the findings. A detailed summary of the discussion can be found in the report for this item.

Mr. Jackson said that the committee also brainstormed ideas how for the committee can strengthen its relationship with the TPB. He said two main themes came from the discussion. First, the committee wants more information so they can feel prepared and empowered to interact with elected officials on the board. Second, the committee feels it is important to have an opportunity to meet with board members. He said this meeting would provide an opportunity for the CAC members to explain the mission and role of the CAC and allow the board members to talk about how they approach coordinating local plans and regional policies.

Mr. Aguirre said that the Access for All Advisory Committee met on November 12. The committee was briefed on a pilot project to improve transportation for in-state renal dialysis patients called Rides to Help. He said the committee was also briefed by Montgomery County Department of Transportation about planning and designing streets to be safer and more accessible for people with vision disabilities. The last item was the Climate Change Mitigation Study of 2021. Finally, he said that the committee supports the requirement that rental scooters be locked to make sidewalks easier and safer for people to use.

Chair Allen observed that the lack of available and secure parking for scooters mean that people are seeking out other unforeseen opportunities to lock scooters.

Ms. Krimm said that there is $1.7 billion in the infrastructure bill for public transportation. She asked if there will be an advocacy campaign for paratransit using some of that money.

Mr. Srikanth asked Ms. Krimm to clarify whether she was asking the AFA about how they are looking at or evaluating spending programs, or if she was asking the TPB to create an advocacy campaign.

Ms. Krimm said either one. She said she thinks there should be some advocacy to tap into the money that is coming through the infrastructure bill.

Mr. Srikanth said that the next item references a summary that staff developed on what is in the $1.2 trillion infrastructure bill. He said that the bill offers additional funding for existing programs and also for new programs. He said that federal agencies are anticipated to issue detailed rulemaking and program guidelines and at that time there will be opportunities to consider any collective or individual actions to go after any competitive grant funding.

Mr. Lewis reiterated that the federal agencies need to flesh out their rules for how those funds will be

administered.

Ms. Krimm said she brought it up because paratransit always seems to be at the bottom of the list for funding.

Mr. Aguirre said that the region needs to have a larger discussion around paratransit, and he hopes that the AFA can discuss this topic next year. He said if there is money for paratransit, the region needs to pursue it.

5. STEERING COMMITTEE ACTIONS AND DIRECTOR'S REPORT

Mr. Srikanth said the Steering Committee met on November 5. He said that details from the meeting can be found in the report for this item. He said that on page 14 of the report is a letter from the TPB to WMATA's general manager about a study to redesign WMATA's bus service. He said that during the October board meeting Mr. Kannan mentioned that a network redesign had been scoped and funded but had not yet begun. He said this letter urges WMATA to start that bus network redesign as early as possible.

Mr. Srikanth reported on two other topics. First, he said that the Street Smart safety campaign had an in-person launch event on November 4 in Oxon Hill, Prince George's County. Second, he said that on Monday, the president signed the Infrastructure Investment and Jobs Act, a bill that proposes federal investment totaling about $1.2 trillion in several sectors over the next five to eight years. He said that staff pulled together a high-level summary of the bill. He said that this is not a one-time stimulus funding, but rather it is an ongoing program. He said that of this funding, $650 billion is to support preexisting programs and $550 billion is new funding. He said that a considerable amount of new funds will be distributed on a formula basis and that all states, including the District of Columbia, are guaranteed a minimum amount of money.

Mr. Srikanth referenced Ms. Krimm's comment earlier. He said that later today the board will be asked to approve $6.6 million in Enhanced Mobility projects and this program is anticipated to receive additional funding under the new law.

Mr. Brown asked if "Section 107: Member Designated Project Authorizations" was part of the infrastructure bill.

Ms. Srikanth said that he would need to consult the legislative text to answer that question.

6. CHAIR'S REMARKS

Chair Allen said that the Infrastructure Investments and Jobs Act is a historic action that invests in a breadth of sectors over time. He said the bill will provide funding for a number of topics that the TPB has been working on: maintenance and state of good repair for bridges and transit, roadway safety, addressing climate change, reconnecting communities by removing or mitigating physical infrastructure barriers, and improving accessibility and facilitating economic development. He said it is an amazing opportunity, and he encouraged jurisdictions to pursue the money for themselves and also to work collectively for some regional priorities.

Chair Allen said that he is convening a nominating committee to develop a slate of candidates for the position of chair and vice-chairs for 2022. He thanked Mr. Dorsey and Ms. Newton for serving on the committee.

Chair Allen said that a technical work session will be held on December 13 to brief the board on the results of the TPB's Climate Change Mitigation Study of 2021. He encouraged members to participate.

ACTION ITEMS

7. ENHANCING REGIONAL ROADWAY SAFETY ENFORCEMENT

Chair Allen thanked the Steering Committee for accepting his proposal to bring this item to the board. He said that the board has been very active and consistent in wanting to reduce roadway fatalities and serious injuries in the region. He said that the resolution adopting roadway safety targets clearly noted the board's dissatisfaction on the state of roadway safety in the Washington region. He said the board spent time and money conducting a detailed roadway safety study and identifying a comprehensive set of strategies to improve roadway safety. Earlier this year, the board approved the first set of technical assistance projects to help develop ideas, programs, and policies to improve roadway safety. He said that throughout all this work, enforcement has been recognized as one of the important strategies for making roads safer.

Chair Allen said that in this region, with three states and many local jurisdictions, drivers are constantly crossing state lines and are governed by different legal authorities. He said that in this context enforcement is challenging. He said that fortunately the three states belong to a national compact to assist each other with traffic enforcement. He said that a continuing issue is that the compact does not cover enforcement of citations issued by automated traffic enforcement devices. He said that in this region unsafe drivers are taking advantage by racking up fines and not paying them. He said he believes that the TPB has made roadway safety a priority and that it should write to the governors of Maryland and Virginia, and the mayor of the District of Columbia, encouraging them to work together to establish interjurisdictional reciprocity of automated enforcement citations to improve regional traffic safety. He said that a draft of this letter has been shared with the board.

Chair Allen made a motion to approve a letter from the TPB to the governors of Maryland and Virginia and the Mayor of the District of Columbia to establish interjurisdictional reciprocity of automated enforcement citations to improve regional traffic safety.

Mr. Snyder seconded the motion.

Ms. Henderson thanked staff for drafting this letter. She referred to fatalities in D.C. that resulted from traffic violence. She encouraged the board to approve the letter.

Mr. Dorsey said he supports the merits of this effort. He said he was concerned about process. Specifically, he wanted to give the jurisdictions an opportunity to discuss the issue internally before asking the TPB to send the letter. He said that he did not want the process to exclude local voices by engaging in a direct appeal to the chief executives in each state.

Chair Allen asked for clarification on Mr. Dorsey's recommendation.

Mr. Dorsey asked that the board defer consideration of the letter until December. He said that would give local jurisdictions an opportunity to offer a letter or resolution in support of this effort before a letter from the TPB is sent to the chief executives.

Chair Allen said the intent of the letter is to encourage the chief executives to work together to find a solution. He said that the TPB is not trying to be the arbiter of that agreement.

Mr. Dorsey said he believes that the jurisdictions should weigh in and inform the TPB before it engages with the executives. He said speaking generally he does not want a precedent set where the TPB decides to pursue an agenda and engage the chief executives on an issue over the objections of affected jurisdictions.

Chair Allen said that the intent of the discussion at the October meeting recognized that each of the jurisdictions are experiencing traffic violence, injuries, and fatalities. He said that drivers are driving dangerously throughout the region. He wants these drivers to be held accountable. He noted that the action that we had talked about last month and the letter to put forward, was to call on those executives to work together to find a solution not being prescriptive about what that solution should be.

Mr. Dorsey said that the jurisdictions have not weighed in on this issue in any official capacity. He said that DC had a legislative process to determine that this is the local position. He asked that other jurisdictions be given the opportunity to have that discussion locally before the TPB reaches out to the executives.

Chair Allen asked if Mr. Dorsey felt that his jurisdiction had not authorized him to vote in favor of support in a call for unified enforcement.

Mr. Dorsey said he felt comfortable that his jurisdiction would support the decision to engage in the effort. However, he said his preference would be that his jurisdiction's voice be the principal voice asking the Virginia governor to engage in this kind of relationship, and not proxying that role to the TPB.

Chair Allen said he believes that as a regional body, the TPB should be able to lay out key principles. He does not believe the letter, as written, would preclude jurisdictions from acting.

Ms. Umstattd said that she would like to support the initiative. She said her concern is that Virginia's state legislation is not necessarily compatible with D.C.'s or Maryland's. For that reason, as well as the concerns put forward by Mr. Dorsey, she said that she was not sure if the board should support the action at this time. She said that should the board want to act on this item today, she has some recommended language that would acknowledge the difference in the legislation among the three jurisdictions

Ms. Rishell said she would be comfortable resolving this today.

Ms. Sebesky echoed Mr. Dorsey's comments. She said the merits of this letter and keeping people safe are important. She said that if this gets passed it would likely affect all of Virginia, not just northern Virginia. She asked that the board defer action so members can consult with their legislators.

Mr. Glaros said that Prince George's County is about to recess its council sessions and that they would not be able to pass a resolution before late January. She proposed that the board approve the letter today but wait to send it until jurisdictions have had the time to pass resolutions of support locally.

Ms. Russell concurred with Mr. Dorsey and Ms. Sebesky on taking a bit of time. She said that like Virginia, in Maryland too there are differences between jurisdictions with automated enforcement. Taking some time today will provide for consultation among the jurisdictions.

Ms. Kostiuk said she had previously noted her equity concerns about enforcing primary seatbelt laws and those concerns would be applicable here as well. She said while she supports the focus of the letter, she will abstain from voting.

Chair Allen said that enough members from Virginia and Maryland voiced concern that he acknowledged that it feels inconsistent from where he thought the conversation was a month ago. He addressed Mr. Glaros' concern and said that there was no request that each jurisdiction pass resolutions. He said that he would withdraw the item to give everyone additional time to discuss any issues that may want to have addressed in the letter and that he would bring it back in December. In the meantime, he said that staff can work with board members to think through the concerns and arrive at a solution that works for the board.

Mr. Snyder supported postponing the item and said he has suggested language that applies to Virginia.

Mr. Lewis said that this is a good initiative, but he thought that postponing the vote is a good decision.

Mr. Conklin asked if staff could develop a brief summary of automated enforcement practices among the jurisdictions in the region.

Mr. Srikanth said that staff would look into automated enforcement practices in the region. He said that the issue is that once the authority is granted, how does one go about implementing this in an equitable manner and what degree of recourse would each jurisdiction be willing to implement.

8. 2021 ENHANCED MOBILITY GRANT PROGRAM APPROVAL

Mr. Aguirre thanked staff and the review committee for the time they spent overseeing the process and reviewing project applications.

Ms. Winchell-Mendy thanked Mr. Aguirre. She provided a brief overview of the Enhanced Mobility program. She said there was approximately $6.6 million in Federal Transit Administration dollars and that $11.1 million dollars were requested in the applications. She said the selection committee recommended funding 21 of the 23 received applications. She referenced the memo for this item and said it contains more detail on the specific projects. She said seven projects were selected for mobility management. Three projects were specific to operations. Two projects were selected for vehicle acquisition only. Three projects were selected for wheelchair accessible taxis and their operations. Six projects were selected for both capital and operations. She said staff recommend approval of Resolution R5-2022.

Chair Allen made a motion to approve Resolution R5-2022 to approve funding recommendations for Enhanced Mobility and to adopt an amendment of the FY 2021-2024 Transportation Improvement Program (TIP) to include these projects.

Ms. Sebesky seconded the motion.

The board approved Resolution R5-2022.

9. PBPP: TRANSIT SAFETY TARGET APPROVAL

Mr. Randall said that the board was briefed on the federally required targets for transit safety for the region. He said his last presentation covered requirements, how they are applied, and shared the draft targets. He said that in October a board member asked how public safety incidents are recorded vis-à-vis these targets. He said that in general, the transit industry and the federal requirements attempt to distinguish between safety events and public safety or security incidents. He said the latter are not included in these targets or actual performance data for safety. He said that staff recommended approval of Resolution R6-2022.

Chair Allen made a motion to approve Resolution R6-2022 to set Regional Transit Safety Targets.

Ms. Kostiuk seconded the motion.

Mr. Snyder asked if the targets are proposing performance that is better than present performance.

Mr. Randall said that the safety rules, which were part of the Fixing America's Surface Transportation (FAST) Act, only came into effect last year as the pandemic was striking. He said that at this point many transit planners are still reconciling how to handle these targets versus performance because ridership was impacted by the pandemic. He said that this is an area of gradual improvement, as people get more used to target- setting, and as they implement required agency safety plans.

Mr. Snyder asked if the region is pushing itself in terms of improving the safety record of transit with these targets.

Mr. Srikanth said the general answer is yes. That is what the federal regulations require the region to do. He said that the federal regulations also put a constraint on the targets. They must be data-driven on data collected by the agencies for the previous five years. So, their aspirations and ambitions might be better than the targets, but they are forced by what the data shows. He said that this is the same process used for the roadway safety targets.

Ms. Kostiuk asked if it was possible to consider the roadway and safety targets at the same time in the future.

Mr. Srikanth said that staff had planned to present both topics for approval together. He said that there has been a lag in the highway safety data which prevented plans to bring both topics at the same time .

The board approved Resolution R6-2022. Mr. Snyder abstained.

INFORMATIONAL ITEMS

10. CONNECTED AND AUTOMATED VEHICLES: UPDATE ON RECENT ACTIVITIES AND REVIEW OF DRAFT REGIONAL PRINCIPLES

Mr. Meese said that TPB staff undertook a process to strengthen the regional understanding of connected and automated vehicle (CAV) impacts. He said that this work informed development of a draft set of principles. He described the approach that staff took to develop the principles, including work with advisory and technical sub-committees. He said the goal is that the principles, once approved by the board, would be included in the 2022 Visualize 2045 update. He referenced a consultant-written white paper that looked at TPB goals, policies, and activities that may substantially interact with deployment impacts, roles, and responsibilities. He said the white paper is about how CAVs may impact TPB activities. He shared some presentation slides covering this work.

Mr. Meese said that the CAV principles were written for brevity and positive phrasing, and to stay within the TPB's purview. He said that there are 18 principles. He said that the principles focus on outcomes in these topic areas: safety, equity, mobility, accessibility, support of transit, environmental land-use objectives, reduction of VMT, security, goods movement, legal liability, and operations. More detail on the principles can be found in the presentation and memo.

Chair Allen asked for clarification about when the board will take action on these items.

Mr. Meese said that the board is expected to approve the principles in January, but that it could be later.

Mr. Krimm said that Maryland has a CAV working group. She asked if there has been any interaction between the TPB and that working group.

Mr. Meese said that there is an MDOT-level working group and a SHA-level working group. He said he has listened in on an MDOT meeting and participated in the SHA meeting. He said it has been useful.

Mr. Lewis said that the MDOT working group has been around for nearly six years.

Ms. Krimm asked if the MDOT working group has an update on the Westminster pilot.

Mr. Lewis said that he does not have the details, but that corridors are being considered.

Ms. Russell asked whether the principles address moral questions that CAV software might need to confront, such as when a vehicle has to choose one terrible outcome versus another terrible outcome.

Mr. Meese said the group did discuss the topic and that principles 1 and 2 are phrased in a way that is meant to encompass this.

Mr. Wojahn asked if the transit piece might be made more explicit. He also asked how these principles would be operationalized.

Mr. Meese said that he did not focus on principle 7, which covers enhancing the provision of transit, including providing opportunities for micro-transit to the region's high-capacity transit stations. He added that principle 6 supports priority transit on the region's roadways. He said the last principle covers staff's continuing work on this. He said there is perhaps more that could be said on how to operationalize the principles.

11. VOICES OF THE REGION: FOCUS GROUPS

Ms. Bond said that the early in 2021 TPB staff conducted eleven focus groups. These focus groups are part of Voices of the Region, a public outreach initiative for Visualize 2045 that included a regional public opinion survey and a poster campaign that solicited comments via QR codes. The focus group participants reflected a diversity of geographic location, income, age, race, and education. A key goal was to hear from members of underrepresented communities to gather a diversity of perspectives and backgrounds.

Ms. Bond said that the focus groups resulted in 17 hours of audio and 600 pages of transcript. She said that throughout the presentation she would read quotes from the focus groups. She summarized findings from the focus groups. Those quotes and more detail on the findings are part of the materials for this item.

Ms. Bond said that the focus groups asked participants questions on transportation equity, safety, and climate change. She said themes include affordability, inadequate services for disadvantaged communities, missing bicycle and pedestrian infrastructure, concerns about reckless driving, environmentally-friendly travel options are often not feasible or affordable, and that climate change is not an immediate person priority. She shared key takeaways for transportation agencies on each topic. Those takeaways were included in the meeting materials.

Ms. Kostiuk said she appreciated the emphasis on equity. She said there is a gap in the populations studied in that there was no input from young people. She encouraged staff to reach out to even more groups in the future.

Ms. Bond agreed that younger demographics deserve special attention because they often are missing from public participation. She said that within the specific focus groups, there was diversity of age present. There were also many people who had children and commented about challenges getting their kids to and from school.

Ms. Kostiuk encouraged staff to do outreach to teens.

Mr. Snyder said that these findings are extremely useful for validating what planners and decision-makers already know.

12. ADJOURN

Chair Allen reminded the board that there is a TPB work session scheduled for December 13 from 3:00 to 4:00 p.m. This session will cover the results of the TPB's Climate Mitigation Study of 2021. He said the final board meeting of the year is on December 15.

Mr. Marsden said that the Virginia governor's transportation conference is being held in Arlington the first three days of December. He said the topics include connected and automated vehicles. He asked for permission to use some of Mr. Meese's slides from his presentation today.

Mr. Srikanth said that staff will share the presentation.

No other business was brought to the board. The meeting adjourned.

Meeting Highlights
TPB Technical Committee – December 3, 2021

The Technical Committee met on Friday, December 3, 2021. Meeting materials can be found here: mwcog.org/events/2021/12/3/tpb-technical-committee/

The following items were reviewed for inclusion on the TPB's December agenda.

TPB AGENDA ITEM 9 – REGIONAL ROADWAY SAFETY PROGRAM PROJECT APPOVALS
The committee was briefed on applications received as part of the second round of the Regional Roadway Safety Program technical assistance. The board will be briefed and asked to approve the recommended applications for funding for FY 2022.

TPB AGENDA ITEM 10 – DRAFT 2018-2022 HIGHWAY SAFETY TARGETS
The committee was briefed on the draft regional targets for highway safety. The board will be asked to approve the final regional targets at its January meeting.

TPB AGENDA ITEM 11 – DRAFT RESULTS FROM THE TPB CLIMATE CHANGE MITIGATION STUDY
The committee was briefed on the draft results of the TPB Climate Change Mitigation Study (CCMS) of 2021. The CCMS is a scenario study whose goal is to identify potential pathways for the region to reduce on-road, transportation-sector greenhouse gas emissions to meet COG's regional greenhouse gas (GHG) reduction goals associated with 2030 and 2050. The TPB will be briefed on these results during a special work session on December 13, 2021 and will discuss the matter further at its regular meeting on December 15.

The following items were presented for information and discussion:

VISUALIZE 2045 UPDATE – PERFORMANCE ANALYSIS MEASURES
This briefing was postponed to the January 2022 Technical Committee meeting.

MOVE DC UPDATE
The committee was briefed on MoveDC, DDOT's long-range transportation plan, that was updated this past year.

11TH STREET BRIDGE PARK
The committee was briefed on plans to build a park on the old 11th Street Bridge that crosses the Anacostia River. The presentation included discussion about how the plan aligns with regional transit and equity goals and how it connects to the region's bicycle and pedestrian infrastructure.

OTHER BUSINESS

- COG hybrid / in-person meeting status report
- Reciprocity letter status
- CAV principles update
- Resiliency study update
- Project InfoTrak update
- The FY 2023 TLC project solicitation kickoff is December 17
- Norman Whitaker (VDOT) is retiring!

TPB COMMUNITY ADVISORY COMMITTEE
ANNUAL REPORT

December 15, 2021

Elisa Walton, CAC Chair

The Community Advisory Committee (CAC) met 10 times in 2021 to fulfill their mission *to promote public involvement in transportation planning for the region, to advance equitable representation in regional transportation planning, and to provide region-oriented community advice to the TPB on transportation plans and issues.* This report summarizes CAC discussions and activities over the course of the year.

In November 2020, the TPB approved a suite of updates to the CAC (R11-2021) that included changing the name of the committee and updating the committee structure to ensure the committee better reflects the region's racial and ethnic diversity as well as different perspectives from people with different ages and experiences getting around the region.

The 2021-2022 CAC consisted of 9 returning members and 15 new members. One of the goals for the year was to find a way to make online-only meetings as engaging and productive as in-person meetings. To do this, the committee tried to balance briefings, feedback and small group discussions. The CAC engaged on key issues facing the region, including current debates around highway expansion, and broader topics such as climate change and safety. Members shared perspectives and provided insight into these topics and the diverse impacts they have across the region.

2021 HIGHLIGHTS

In 2021, the CAC contributed to many items that were brought before the board. Four topics received the most discussion: climate change, Visualize 2045, roadway safety, and project inputs for the long-range plan update.

Climate Change

During 2021, climate change was a big topic of discussion at the TPB and at the CAC. The recognition that climate change will have noticeable impacts on the region was met with a desire to have an impact by exploring ways to reduce greenhouse gas emissions from the region's transportation system. The CAC applauds the TPB for conducting the Climate Change Mitigation Study of 2021.

The committee encourages the TPB to continue taking climate change seriously and to work with member jurisdictions and agencies to act swiftly to mitigate climate impacts from the region's transportation system. The CAC also urges the TPB and MWCOG staff to leverage the CAC for help messaging the CCMS more broadly.

Visualize 2045

The TPB's quadrennial long-range transportation plan updates touches on all work conducted by the TPB. As such, the CAC received eight briefings on Visualize 2045 in 2021. These briefings covered an overview of the plan and its contents, project selection for the constrained element, results from the public opinion survey and focus groups, and public comment. Throughout these briefings, committee members provided input and advice to staff.

Additionally, CAC members participated in a Voices of the Region focus group alongside members of the Access for All Advisory Committee. This focus group served to introduce members of the two committees and provided them an opportunity to experientially learn about the survey questions and methodology.

The committee asks to stay involved in the development of Visualize 2045 and is eager to support TPB staff in raising awareness and promoting public involvement in the plan as it nears approval in 2022.

Roadway Safety

For the last several years, the CAC has advocated for making the region's roadways and transportation system safer for all users. This advocacy culminated with board approval of a set of regional safety recommendations, including the creation of the Regional Roadway Safety technical assistance program. During 2021, the CAC continued to regularly meet with TPB safety staff to track the process on the roadway safety technical assistance work.

The committee encourages the TPB to continue funding the Regional Roadway Safety Program and ensure that roadway safety is a priority for the board as well as member jurisdictions and agencies. The committee also encourages all member jurisdictions to participate in this technical assistance opportunity to increase roadway safety.

Project Inputs for the Visualize 2045 Plan Update

Like the board, the CAC had passionate discussions about project inputs for the air-quality conformity analysis of Visualize 2045. At the July committee meeting, Mr. Srikanth briefed the committee on board action to not include the I-495/I-270 projects. The committee was split on this decision but had a good discussion that resulted in a set of principles that the CAC believes the TPB should follow in the process of approving project inputs for the long-range transportation plan.

The following principles highlight the diversity of perspectives represented on the CAC. For more detail on these principles refer to the July 2021 CAC report.

- Only include projects in the long-range plan when they are ready.
- Consistency is vital.
- Clear public information is essential.
- Consider the diversity of the region.
- Be open to new ideas.
- Don't reinvent the wheel; build on past planning work.
- The TPB is the best place to consider the regional perspective.
- Take regional aspirations seriously.
- Respect expert opinions.

Other highlights

In addition to the above, the committee was briefed on many topics in 2021, including: the Regional Travel Survey, the Transportation Land-Use Connections program, the State of Public Transportation Report, the Transit Within Reach program, Enhanced Mobility, Connected and Automated Vehicles, and the Street Smart Bicycle and Pedestrian Safety program.

LOOKING TOWARD 2022

For the first time, CAC members were appointed to serve a two-year term. This means member appointed to serve in 2021 will return for 2022. Looking toward the year ahead, the group shared ideas for how to be purposeful in their discussions and how to have an impact as a committee.

The committee expressed interest in starting the new year with a work session, so members can work together to articulate common goals for the committee in 2022. This includes discussing the value that the CAC brings to the TPB process and how best the committee can work with the board. This discussion should also explore how the CAC can help communication about regional values in a way that resonates locally and ways that the committee can support the board.

Other suggestions for 2022 include:

- Several members mentioned that they'd like to learn more about how transportation projects are developed and funded.
- The committee also expressed interest in learning more about the impact of the pandemic on travel patterns. They expressed interest in the demonstrated benefits of fewer trips during the pandemic, how things might change as more people return to work in-person and other regional impacts of this shift.
- There was a request for a presentation on the past decade of TPB studies, reports, and plans. They said this would show the breadth and depth of TPB work.
- Encourage the CAC chair and the TPB chair to meet regularly. A strong relationship between the two chairs helps keep the board invested in the CAC and the committee engaged with the board. Additionally, members should seek to build relationships with all three TPB officers and TPB members from their home jurisdictions.
- One member said they miss in-person meetings. They said it was hard to feel connected with peers on the committee when meetings are online-only. They recommended resuming some in-person meetings as soon as it is safe to do so.

2021 CAC MEMBERSHIP

Name	Jurisdiction	State
Ashley Huston	City of Manassas	VA
Audrey Nwaze	City of Greenbelt	MD
Dan Papiernik	Fairfax County	VA
Delia Houseal	Ward 7	DC
Delishia Pittman	Prince George's County	MD
Edith Goldman, resigned	Prince George's County	MD
Elisa Walton, CAC Chair	Ward 6	DC
Emmet Tydings	Montgomery County	MD
Eyal Li	City of Takoma Park	MD
Jeff Jamawat	Ward 1	DC
Jeff Parnes	Fairfax County	VA
Jemila Kia James	Ward 7	DC
Justin Isbell	City of Alexandria	VA
Katherine Kortum	Ward 6	DC
Lorena Rios	Loudoun County	VA
Michael Artson	Prince William County	VA
Nancy Abeles	Montgomery County	MD
Prince Coulibaly	City of Gaithersburg	MD
Ra Amin	Ward 5	DC
Rafael Sampayo	Arlington County	VA
Robert Jackson	Fairfax County	VA
Ron Skotz	City of Bowie	MD
Solomon Haile	Fairfax County	VA
Tracy Duvall	City of Takoma Park	MD

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board
FROM: Kanti Srikanth, TPB Staff Director
SUBJECT: Steering Committee Actions and Report of the Director
DATE: December 9, 2021

The attached materials include:

- Steering Committee Actions
- Announcements and Updates

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board
SUBJECT: Steering Committee Actions
FROM: Kanti Srikanth, TPB Staff Director
DATE: December 9, 2021

At its meeting on December 3, the TPB Steering Committee reviewed and approved resolution TPB SR8-2022 to amend the FY 2021-2024 Transportation Improvement Program (TIP) to include TIP Action 21-38., at the request of the Maryland Department of Transportation – State Highway Administration (MDOT-SHA). This action adds a net total of approximately $2.9 million to the MD 4 at Suitland Parkway Interchange Construction project (TIP ID 3547) by reducing funding in FY 2021 and the year prior to the TIP by approximately $60 million and increasing funding in fiscal years 2022 through 2024 by a total of $62.9 million. Funding for this project was included in the financial analysis of Visualize 2045. Due to the size and scope of the project, it has been deemed "not regionally significant" with regard to the travel modeling process and the conformity requirement, and therefore is not required to be included in the air quality conformity analysis of the long-range plan and TIP.

The TPB Bylaws provide that the Steering Committee "shall have the full authority to approve non-regionally significant items, and in such cases, it shall advise the TPB of its action." The director's report each month and the TPB's review, without objection, shall constitute the final approval of any actions or resolutions approved by the Steering Committee.

Attachments

- Approved resolution TPB SR8-2022 to amend the FY 2021-2024 TIP to include TIP Action 21-38, adding funds to the MD 4 at Suitland Parkway Interchange Construction project, as requested by MDOT-SHA.

TPB Steering Committee Attendance – December 3, 2021
(only voting members listed)

TPB Chair/DC rep:	Charles Allen
TPB Vice Chair/VA rep.:	Pamela Sebesky
DDOT:	Mark Rawlings
MDOT:	Kari Snyder
VDOT:	Norman Whitaker
WMATA:	Mark Phillips
Technical Committee Chair:	Jason Groth
Previous TPB Chair:	Kelly Russell
DC rep.:	Chris Laskowski

TPB SR8-2022 Approved
December 3, 2021

NATIONAL CAPITAL REGION
TRANSPORTATION PLANNING BOARD
777 North Capitol Street, N.E.
Washington, D.C. 20002

RESOLUTION ON AN AMENDMENT TO THE FY 2021-2024 TRANSPORTATION IMPROVEMENT PROGRAM (TIP) THAT IS EXEMPT FROM THE AIR QUALITY CONFORMITY REQUIREMENT TO INCLUDE TIP ACTION 21-38 WHICH ADDS FUNDING TO THE MD 4 AT SUITLAND PARKWAY INTERCHANGE CONSTRUCTION PROJECT, AS REQUESTED BY THE MARYLAND DEPARTMENT OF TRANSPORTATION (MDOT)

WHEREAS, the National Capital Region Transportation Planning Board (TPB), which is the metropolitan planning organization (MPO) for the Washington Region, has the responsibility under the provisions of the Fixing America's Surface Transportation (FAST) Act for developing and carrying out a continuing, cooperative and comprehensive transportation planning process for the Metropolitan Area; and

WHEREAS, the TIP is required by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) as a basis and condition for all federal funding assistance to state, local and regional agencies for transportation improvements within the Washington planning area; and

WHEREAS, on March 18, 2020 the TPB adopted the FY 2021-2024 TIP; and

WHEREAS, MDOT has requested an amendment to the FY 2021-2024 TIP to include TIP Action 21-38 which adds a net total of $2.873 million to the **MD 4 at Suitland Parkway Interchange Construction project** (**TIP ID 3457**) by reducing total prior funding by $28.6 million, and total FY 2021 funding by $31.3 million; and increasing total FY 2022 funding by $17.5 million, total FY 2023 funding by $22 million, and total FY 2024 funding by $23.3 million; as described in Attachment C of the attached materials; and

WHEREAS, the attached materials include: Attachment A) TIP Project Overview report showing how the project will appear in the TIP after the action is approved; Attachment B) Amendment Summary report showing the change in total project cost, reason for the amendment, and a Change Summary providing line-item changes to every programmed amount by fund source, fiscal year, and project phase; Attachment C) Funding Change Detail report that presents the Change Summary in table format; and Attachment D) a letter from MDOT dated November 19, 2021 requesting the amendment; and

WHEREAS, the updates to this project have been entered in the TPB's Project InfoTrak database application under TIP Action 21-38, creating the 38th version of the FY 2021-2024 TIP, which supersedes all previous versions of the TIP and can be viewed online at www.mwcog.org/ProjectInfoTrak; and

WHEREAS, full funding for this project was included in the Visualize 2045 Financial Plan; and

WHEREAS, this project is deemed "not regionally significant" (NRS) with regarded to the conformity requirement due to its scope and scale, and therefore is not required to be included in the air quality conformity analysis of the long-range plan and TIP; and

WHEREAS, this resolution and amendment to the FY 2021-2024 TIP shall not be considered final until the Transportation Planning Board has had the opportunity to review and accept these materials at its next full meeting;

NOW, THEREFORE, BE IT RESOLVED THAT the Steering Committee of the National Capital Region Transportation Planning Board amends the FY 2021-2024 TIP to include TIP Action 21-38 which adds a net total of $2.873 million to the **MD 4 at Suitland Parkway Interchange Construction project** (**TIP ID 3457**) by reducing total prior funding by $28.6 million, and total FY 2021 funding by $31.3 million; and increasing total FY 2022 funding by $17.5 million, total FY 2023 funding by $22 million, and total FY 2024 funding by $23.3 million; as described in Attachment C of the attached materials.

Approved by the TPB Steering Committee at its virtual meeting on December 3, 2021.

National Capital Region
Transportation Planning Board

Attachment A
FY 2021-2024 Transportation Improvement Program
MDOT/State Highway Administration

TIP Action 21-38: Formal Amendment
Approved by the TPB Steering Committee
on December 3, 2021

TIP ID 3547
Project Name MD 4 at Suitland Parkway Interchange Construction
Project Limits Interchange on MD 4

Lead Agency MDOT/State Highway Administration
County Prince Georges
Municipality
Agency Project ID PG6181

Project Type Road - Interchange improvement
Total Cost $208,401,000
Completion Date 2027

Description Construction of a new MD 4 interchange at Suitland Parkway.

Phase	Source	Prior	FY2021	FY2022	FY2023	FY2024	Future	Total
PE	NHPP	$7,579,000	-	-	-	-	-	$7,579,000
PE	STATE	$4,800,000	$137,000	$4,600,000	$1,468,000	-	-	$11,005,000
Total PE		$12,379,000	$137,000	$4,600,000	$1,468,000	-	-	$18,584,000
ROW	NHPP	$7,956,000	-	$516,000	$161,000	$64,000	-	$8,697,000
ROW	PL	-	-	$517,000	$162,000	$64,000	-	$743,000
ROW	STATE	$2,021,000	-	$54,000	$17,000	$7,000	-	$2,099,000
Total ROW		$9,977,000	-	$1,087,000	$340,000	$135,000	-	$11,539,000
CON	NHPP	$24,936,000	$7,229,000	$9,634,000	$17,195,000	$22,020,000	$68,019,000	$149,033,000
CON	STATE	$6,234,000	$380,000	$507,000	$905,000	$1,159,000	$3,581,000	$12,766,000
Total CON		$31,170,000	$7,609,000	$10,141,000	$18,100,000	$23,179,000	$71,600,000	$161,799,000
UT	NHPP	-	$1,215,000	$3,953,000	$3,663,000	-	-	$8,831,000
UT	STATE	$7,183,000	$64,000	$208,000	$193,000	-	-	$7,648,000
Total UT		$7,183,000	$1,279,000	$4,161,000	$3,856,000	-	-	$16,479,000
Total Programmed		**$60,709,000**	**$9,025,000**	**$19,989,000**	**$23,764,000**	**$23,314,000**	**$71,600,000**	**$208,401,000**

Version History

TIP Document	MPO Approval	FHWA Approval	FTA Approval
21-08 Amendment 2021-2024	09/18/2020	N/A	N/A
21-38 Amendment 2021-2024	12/03/2021	*Pending*	N/A
23-00 Adoption 2023-2026	*Pending*	*Pending*	N/A

Current Change Reason

SCHEDULE / FUNDING / SCOPE - Cost change(s), Programming Update, Schedule Change(s)

Funding Change(s):
Total project cost increased from $205,528,000 to $208,401,000

Attachment B

Summary Report for TIP Action 21-38: Formal Amendment to the FY (2021-2024) Transportation Improvement Program Requested by the Maryland Department of Transportation - State Highway Administration
Approved by the TPB Steering Committee on December 3, 2021

TIP ID	PROJECT TITLE	COST BEFORE	COST AFTER	COST CHANGE	% CHANGE	CHANGE REASON	CHANGE SUMMARY
3547	MD 4 at Suitland Parkway Interchange Construction	$205,528,000	$208,401,000	$2,873,000	1%	Cost change(s), Programming Update, Schedule Change(s)	PROJECT CHANGES (FROM PREVIOUS VERSION): **Public Lands** ► Add funds in FFY 22 in ROW for $517,000 ► Add funds in FFY 23 in ROW for $162,000 ► Add funds in FFY 24 in ROW for $64,000 **State Funding** - Decrease funds in FFY 19 in PE from $5,262,000 to $4,800,000 - Decrease funds in FFY 19 in ROW from $8,818,000 to $1,047,000 - Decrease funds in FFY 19 in CON from $8,224,000 to $3,117,000 + Increase funds in FFY 19 in UT from $0 to $7,183,000 - Decrease funds in FFY 20 in ROW from $4,250,000 to $974,000 + Increase funds in FFY 20 in CON from $475,000 to $3,117,000 + Increase funds in FFY 21 in PE from $0 to $137,000 - Decrease funds in FFY 21 in ROW from $2,235,000 to $0 + Increase funds in FFY 21 in CON from $150,000 to $380,000 + Increase funds in FFY 21 in UT from $0 to $64,000 + Increase funds in FFY 22 in PE from $0 to $4,600,000 - Decrease funds in FFY 22 in ROW from $2,441,000 to $54,000 + Increase funds in FFY 22 in CON from $0 to $507,000 + Increase funds in FFY 22 in UT from $0 to $208,000 + Increase funds in FFY 23 in PE from $0 to $1,468,000 - Decrease funds in FFY 23 in ROW from $1,810,000 to $17,000 + Increase funds in FFY 23 in CON from $0 to $905,000 + Increase funds in FFY 23 in UT from $0 to $193,000 **National Highway Performance Program** + Increase funds in FFY 19 in PE from $1,004,000 to $1,519,000 - Decrease funds in FFY 19 in ROW from $8,435,000 to $4,222,000 - Decrease funds in FFY 19 in CON from $21,088,000 to $12,468,000 + Increase funds in FFY 20 in ROW from $0 to $3,734,000 - Decrease funds in FFY 20 in CON from $25,709,000 to $12,468,000 - Decrease funds in FFY 21 in CON from $37,967,000 to $7,229,000 + Increase funds in FFY 21 in UT from $0 to $1,215,000 ► Add funds in FFY 22 in ROW for $516,000 CON for $9,634,000 UT for $3,953,000 ► Add funds in FFY 23 in ROW for $161,000 CON for $17,195,000 UT for $3,663,000 ► Add funds in FFY 24 in ROW for $64,000 CON for $22,020,000 *Total project cost increased from $205,528,000 to $208,401,000*

Attachment C

Funding Change Detail Report for TIP Action: 21-38 Formal Amendment to the FY 2021-2024 Transportation Improvement Program

Requested by: Maryland Department of Transportation - State Highway Administration

SOURCE	TIP Action	PRIOR TOTAL	2021 PE	2021 ROW	2021 CON	2021 UT	2021 TOTAL	2022 PE	2022 ROW	2022 CON	2022 UT	2022 TOTAL	2023 PE	2023 ROW	2023 CON	2023 UT	2023 TOTAL	2024 PE	2024 ROW	2024 CON	2024 UT	2024 TOTAL	FUTURE TOTAL	GRAND TOTAL
TIP ID 3547 MD 4 at Suitland Parkway Interchange Construction																								
NHPP	21-08	$62,296,000	$0	$0	$37,967,000	$0	$37,967,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$68,019,000	$168,282,000
	21-38	$40,471,000	$0	$0	$7,229,000	$1,215,000	$8,444,000	$0	$516,000	$9,634,000	$3,953,000	$14,103,000	$0	$161,000	$17,195,000	$3,663,000	$21,019,000	$0	$64,000	$22,020,000	$0	$22,084,000	$68,019,000	$174,140,000
	DELTA	$21,825,000	$0	$0	$30,738,000	$1,215,000	$29,523,000	$0	$516,000	$9,634,000	$3,953,000	$14,103,000	$0	$161,000	$17,195,000	$3,663,000	$21,019,000	$0	$64,000	$22,020,000	$0	$22,084,000	$0	$5,858,000
STATE	21-08	$27,029,000	$0	$2,235,000	$150,000	$0	$2,385,000	$0	$2,441,000	$0	$0	$2,441,000	$0	$1,810,000	$0	$0	$1,810,000	$0	$0	$0	$0	$0	$1,191,000	$34,856,000
	21-38	$20,238,000	$137,000	$0	$380,000	$64,000	$581,000	$4,600,000	$54,000	$507,000	$208,000	$5,369,000	$1,468,000	$17,000	$905,000	$193,000	$2,583,000	$0	$7,000	$1,159,000	$0	$1,166,000	$1,191,000	$31,128,000
	DELTA	$6,791,000	$137,000	$2,235,000	$230,000	$64,000	$1,804,000	$4,600,000	$2,387,000	$507,000	$208,000	$2,928,000	$1,468,000	$1,793,000	$905,000	$193,000	$773,000	$0	$7,000	$1,159,000	$0	$1,166,000	$0	$3,728,000
PL	21-08	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	21-38	$0	$0	$0	$0	$0	$0	$0	$517,000	$0	$0	$517,000	$0	$162,000	$0	$0	$162,000	$0	$64,000	$0	$0	$64,000	$0	$743,000
	DELTA	$0	$0	$0	$0	$0	$0	$0	$517,000	$0	$0	$517,000	$0	$162,000	$0	$0	$162,000	$0	$64,000	$0	$0	$64,000	$0	$743,000
COMBINED	21-33	$89,325,000	$0	$2,235,000	$38,117,000	$0	$40,352,000	$0	$2,441,000	$0	$0	$2,441,000	$0	$1,810,000	$0	$0	$1,810,000	$0	$0	$0	$0	$0	$69,210,000	$203,138,000
	21-34	$60,709,000	$137,000	$0	$7,609,000	$1,279,000	$9,025,000	$4,600,000	$1,087,000	$10,141,000	$4,161,000	$19,989,000	$1,468,000	$340,000	$18,100,000	$3,856,000	$23,764,000	$0	$135,000	$23,179,000	$0	$23,314,000	$69,210,000	$206,011,000
	DELTA	$28,616,000	$137,000	$2,235,000	$30,508,000	$1,279,000	$31,327,000	$4,600,000	$1,354,000	$10,141,000	$4,161,000	$17,548,000	$1,468,000	$1,470,000	$18,100,000	$3,856,000	$21,954,000	$0	$135,000	$23,179,000	$0	$23,314,000	$0	$2,873,000

MARYLAND DEPARTMENT OF TRANSPORTATION

Larry Hogan
Governor
Boyd K. Rutherford
Lt. Governor
Gregory Slater
Secretary

November 19, 2021

The Honorable Charles Allen
Chairman
National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments
777 North Capitol Street, NE, Suite 300
Washington DC 20002

Dear Chairman Allen:

The Maryland Department of Transportation (MDOT) requests the following amendment to the Maryland potion of the National Capital Region Transportation Planning Board's (TPB) Fiscal Year (FY) 2021-2024 Transportation Improvement Program (TIP) for one existing State Highway Administration (SHA) project as described below and in the attached memo.

This action reflects MDOT SHA's updated programmed expenditures from FY 2021 to FY 2024, and as this project is already in the Air Quality Conformity Determination for Visualize 2045, this action does not need to run a new Air Quality Conformity Determination.

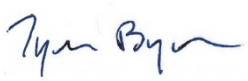
TIP ID	Project	Amount of New Funding (In 000s)	Comment
3547	MD 4 at Suitland Parkway Interchange Construction	$86,627	Add and updates funding levels at each phase

MDOT requests that this amendment be approved by the TPB Steering Committee at its December 3, 2021 meeting.

The revised funding status will not impact scheduling or funding availability for other projects in the current TIP, which continues to be fiscally constrained. The cost does not affect the portion of the federal funding which was programmed for transit, or any allocations of state aid in lieu of federal aid to local jurisdictions.

We appreciate your cooperation in this matter. Should you have additional questions or concerns, please contact Ms. Kari Snyder, MDOT Office of Planning and Capital Programming (OPCP) Regional Planner at 410-865-1305, toll free 888-713-1414 or via e-mail at ksnyder3@modt.maryland.gov. Ms. Snyder will be happy to assist you. Of course, please feel free to contact me directly.

Sincerely,



Tyson Byrne
Regional Planning Manager
Office of Planning and Capital Programming

Attachment
cc: Ms. Kari Snyder, Regional Planner, OPCP, MDOT

MEMORANDUM

TO: DIRECTOR HEATHER MURPHY
OFFICE OF PLANNING AND CAPITAL PROGRAMMING
MARYLAND DEPARTMENT OF TRANPORTATION (MDOT)

ATTN: REGIONAL PLANNING MANAGER TYSON BYRNE
REGIONAL PLANNER KARI SNYDER

FROM: CHIEF MATT BAKER MB
REGIONAL AND INTERMODAL PLANNING DIVISION (RIPD)

SUBJECT: REQUEST TO AMEND THE FY 2021-2024 NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD (TPB) TRANSPORTATION IMPROVEMENT PROGRAM (TIP)

DATE: NOVEMBER 18, 2021

RESPONSE REQUESTED BY: N/A

PURPOSE OF MEMORANDUM

To request the MDOT Office of Planning and Capital Programming approve and forward to TPB for its approval the following TIP amendment.

SUMMARY

The MDOT State Highway Administration (MDOT SHA) hereby requests amendment of the FY 2021-2024 TPB TIP to reflect the following action.

TIP	PROJECT	PHASE	NEW FUNDING
3547	MD 4 at Suitland Parkway Interchange Construction, Westphalia	PE	$6,205,000
		RW	($4,924,000)
		UT	$9,296,000
		CO	$20,912,000

ANALYSIS

MD 4 at Suitland Parkway Interchange Construction (TPB 3547) – This requested amendment reflects the addition of $6,205,000 to TPB 3547 design funding, the subtraction of $4,924,000 from TPB 3547 right-of-way acquisition funding, the addition of $9,296,000 to TPB 3547 utilities funding, and the addition of $20,912,000 to TPB 3547 construction funding in FY 2021-2024. In addition, this amendment shifts unspent programmed funding from previous years for use in FY 2021-2024 and beyond revises the amounts of State and federal funding being programmed toward this project. This funding covers MDOT SHA's remaining costs to complete design of, right-of-way acquisition for, utilities relocation for, and construction as necessitated by the termination of the previous construction contract and subsequent redesign and readvertisement of the MD 4 interchange project at Suitland Parkway. The

project's total cost, as documented in the FY 2021-2024 TPB TIP, is increasing from $134 million to $210 million, including funding programmed in years prior to and beyond the FY 2021-2024 TPB TIP. MDOT SHA anticipates reinitiating construction, based on a revised design, in 2022-2023.

The attached Statewide TIP (STIP) report documents MDOT's requested amendment with respect to funding for the above project. This requested action will not impact scheduling or funding availability for other projects in the current STIP, which remains fiscally constrained. The amended funding does not affect the portion of federal funding programmed for transit or allocations of state aid to local jurisdictions in lieu of federal aid.

In addition, the Maryland Transportation Trust Fund (TTF) remains fiscally constrained. The TTF supports State transportation system operation and maintenance, MDOT administration, debt service, and capital projects. Semiannually, MDOT updates revenues and expenditures using two national forecasting companies' latest economic estimates. MDOT published funding details in the draft FY 2022-2027 Consolidated Transportation Program (https://mdot.maryland.gov/tso/Pages/Index.aspx?PageId=27) and FY 2022-2025 Maryland STIP (https://mdot.maryland.gov/tso/pages/Index.aspx?PageId=117).

Please amend the FY 2021-2024 TPB TIP and FY 2022-2025 Maryland STIP to reflect the funding information provided in the attachments. If you have any questions, please contact Mr. David Rodgers, MDOT SHA Regional Planner, at 410-545-5670 or via email at drodgers1@mdot.maryland.gov.

ATTACHMENTS

- FY 2021-2024 TPB TIP project 3547 report
- FY 2022-2025 Maryland STIP project TPB 3547 report

cc: Mr. Eric Beckett, Deputy Director, Office of Planning and Preliminary Engineering, MDOT SHA
Ms. Lindsay Bobian, Team Leader, Highway Design Division (HDD), MDOT SHA
Eric Marabello, P.E., Director, Office of Highway Development, MDOT SHA
Erica Rigby, P.E., District Engineer, District 3, MDOT SHA
Mr. David Rodgers, Regional Planner, RIPD, MDOT SHA
Barry Smith, P.E., Acting Chief, HDD, MDOT SHA

National Capital Region
Transportation Planning Board

FY 2021-2024 Transportation Improvement Program
MDOT/State Highway Administration

TIP Action 21-38: Formal Amendment Draft
for TPB Steering Committee Review
December 3, 2021

TIP ID 3547
Project Name MD 4 at Suitland Parkway Interchange Construction
Project Limits Interchange on MD 4

Lead Agency MDOT/State Highway Administration
County Prince Georges
Municipality
Agency Project ID PG6181

Project Type Road - Interchange improvement
Total Cost $208,401,000
Completion Date

Description Construction of a new MD 4 interchange at Suitland Parkway.

Phase	Source	Prior	FY2021	FY2022	FY2023	FY2024	Future	Total
PE	NHPP	$7,579,000	-	-	-	-	-	$7,579,000
PE	STATE	$4,800,000	$137,000	$4,600,000	$1,468,000	-	-	$11,005,000
Total PE		$12,379,000	$137,000	$4,600,000	$1,468,000	-	-	$18,584,000
ROW	NHPP	$7,956,000	-	$516,000	$161,000	$64,000	-	$8,697,000
ROW	PL	-	-	$517,000	$162,000	$64,000	-	$743,000
ROW	STATE	$2,021,000	-	$54,000	$17,000	$7,000	-	$2,099,000
Total ROW		$9,977,000	-	$1,087,000	$340,000	$135,000	-	$11,539,000
CON	NHPP	$24,936,000	$7,229,000	$9,634,000	$17,195,000	$22,020,000	$68,019,000	$149,033,000
CON	STATE	$6,234,000	$380,000	$507,000	$905,000	$1,159,000	$3,581,000	$12,766,000
Total CON		$31,170,000	$7,609,000	$10,141,000	$18,100,000	$23,179,000	$71,600,000	$161,799,000
UT	NHPP	-	$1,215,000	$3,953,000	$3,663,000	-	-	$8,831,000
UT	STATE	$7,183,000	$64,000	$208,000	$193,000	-	-	$7,648,000
Total UT		$7,183,000	$1,279,000	$4,161,000	$3,856,000	-	-	$16,479,000
Total Programmed		**$60,709,000**	**$9,025,000**	**$19,989,000**	**$23,764,000**	**$23,314,000**	**$71,600,000**	**$208,401,000**

Version History

TIP Document	MPO Approval	FHWA Approval	FTA Approval
21-08 Amendment 2021-2024	09/18/2020	N/A	N/A
21-38 Amendment 2021-2024	*Pending*	*Pending*	N/A
23-00 Adoption 2023-2026	*Pending*	*Pending*	N/A

Current Change Reason

SCHEDULE / FUNDING / SCOPE - Cost change(s), Programming Update, Schedule Change(s)

Funding Change(s):
Total project cost increased from $133,928,000 to $208,401,000

MARYLAND STATEWIDE TIP FY 2022-2025

MDOT STIP # TPB 3547

SUMMARY TABLE

Project	Amendment Criteria	Conformity Status	Environmental Status	Current Funding Level (000s) Federal	State/Local	Total
MD 4 at Suitland Parkway Interchange Construction (PG6181)	B	Nonattainment/TPB 3446	EA/FONSI 2015	$ -	$ 4,251	$ 4,251
	Administration	**Area/MPO**	**CTP Page**	**Net Funding Change (000s) Federal**	**State/Local**	**Total**
	MDOT SHA	TPB	SHA-PG-4 FY 2022	$ 80,569	$ 6,058	$ 86,627

Description: Construct a new MD 4 interchange at Suitland Parkway.

Justification: Traffic congestion occurs during peak hours and will increase with planned development in the immediate area. This project will relieve existing congestion and will accommodate increasing traffic volumes associated with future growth

INDIVIDUAL REQUEST FORM

STIP/TIP Amendment Criteria

- ☐ A) Adds new individual projects to the current STIP
- ☑ B) Increase/decrease, scope change, advance, delay, or phase change
- ☐ C) Removes or deletes individual listed project from the STIP
- ☐ D) Other

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION

	Funding	FY 2022	FY 2023	FY 2024	FY 2024	Total
Current (000s)	**Total**	$ -	$ -	$ -	$ -	$ -
	Federal	$ -	$ -	$ -	$ -	$ -
	State/Local	$ 2,441	$ 1,810	$ -	$ -	$ 4,251
Proposed (000s)	**Total**	**$ 19,989**	**$ 23,764**	**$ 23,314**	**$ 23,811**	**$ 90,878**
	Federal	$ 14,620	$ 21,181	$ 22,148	$ 22,620	$ 80,569
	State/Local	$ 5,369	$ 2,583	$ 1,166	$ 1,191	$ 10,309
Change (000s)	**Total**	**$ 17,548**	**$ 21,954**	**$ 23,314**	**$ 23,811**	**$ 86,627**
	Federal	$ 14,620	$ 21,181	$ 22,148	$ 22,620	$ 80,569
	State/Local	$ 2,928	$ 773	$ 1,166	$ 1,191	$ 6,058

PHASE DETAIL

Current

Phase	Funding	FY 2022 Federal	FY 2022 State/Local	FY 2023 Federal	FY 2023 State/Local	FY 2024 Federal	FY 2024 State/Local	FY 2025 Federal	FY 2025 State/Local	TOTAL Federal	TOTAL State/Local	TOTAL Total
PE	*State*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
RW	*NHPP*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	PL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	State	$ -	$ 2,441	$ -	$ 1,810	$ -	$ -	$ -	$ -	$ -	$ 4,251	$ 4,251
UT	*NHPP*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	State	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CO	*NHPP*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	State	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total		**$ -**	**$ 2,441**	**$ -**	**$ 1,810**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,251**	**$ 4,251**

Proposed

Phase	Funding	FY 2022 Federal	FY 2022 State/Local	FY 2023 Federal	FY 2023 State/Local	FY 2024 Federal	FY 2024 State/Local	FY 2025 Federal	FY 2025 State/Local	TOTAL Federal	TOTAL State/Local	TOTAL Total
PE	*State*	$ -	$ 4,600	$ -	$ 1,468	$ -	$ -	$ -	$ -	$ -	$ 6,068	$ 6,068
RW	*NHPP*	$ 516	$ -	$ 161	$ -	$ 64	$ -	$ -	$ -	$ 741	$ -	$ 741
	PL	$ 517	$ -	$ 162	$ -	$ 64	$ -	$ -	$ -			
	State	$ -	$ 54	$ -	$ 17	$ -	$ 7	$ -	$ -	$ -	$ 78	$ 78
UT	*NHPP*	$ 3,953	$ -	$ 3,663	$ -	$ -	$ -	$ -	$ -	$ 7,616	$ -	$ 7,616
	State	$ -	$ 208	$ -	$ 193	$ -	$ -	$ -	$ -	$ -	$ 401	$ 401
CO	*NHPP*	$ 9,634	$ -	$ 17,195	$ -	$ 22,020	$ -	$ 22,620	$ -	$ 71,469	$ -	$ 71,469
	State	$ -	$ 507	$ -	$ 905	$ -	$ 1,159	$ -	$ 1,191	$ -	$ 3,762	$ 3,762
Total		**$ 14,620**	**$ 5,369**	**$ 21,181**	**$ 2,583**	**$ 22,148**	**$ 1,166**	**$ 22,620**	**$ 1,191**	**$ 79,826**	**$ 10,309**	**$ 90,135**

MARYLAND STATEWIDE TIP FY 2022-2025

MDOT STIP # TPB 3547 (cont'd)

PHASE DETAIL (cont'd)

Change		FY 2022		FY 2023		FY 2024		FY 2025		TOTAL		
Phase	Funding	Federal	State/Local	Federal	State/Local	Federal	State/Local	Federal	State/Local	Federal	State/Local	Total
PE	*State*	$ -	$ 4,600	$ -	$ 1,468	$ -	$ -	$ -	$ -	$ -	$ 6,068	$ 6,068
RW	*NHPP*	$ 516	$ -	$ 161	$ -	$ 64	$ -	$ -	$ -	$ 741	$ -	$ 741
	PL	$ 517	$ -	$ 162	$ -	$ 64	$ -	$ -	$ -	$ 743	$ -	$ 743
	State	$ -	$ (2,387)	$ -	$ (1,793)	$ -	$ 7	$ -	$ -	$ -	$ (4,173)	$ (4,173)
UT	*NHPP*	$ 3,953	$ -	$ 3,663	$ -	$ -	$ -	$ -	$ -	$ 7,616	$ -	$ 7,616
	State	$ -	$ 208	$ -	$ 193	$ -	$ -	$ -	$ -	$ -	$ 401	$ 401
CO	*NHPP*	$ 9,634	$ -	$ 17,195	$ -	$ 22,020	$ -	$ 22,620	$ -	$ 71,469	$ -	$ 71,469
	State	$ -	$ 507	$ -	$ 905	$ -	$ 1,159	$ -	$ 1,191	$ -	$ 3,762	$ 3,762
Total		**$ 14,620**	**$ 2,928**	**$ 21,181**	**$ 773**	**$ 22,148**	**$ 1,166**	**$ 22,620**	**$ 1,191**	**$ 80,569**	**$ 6,058**	**$ 86,627**

TOTAL PROJECT COST

Prior Cost (≤ FY 2021)		STIP Cost (FY 2022-2025)		Balance to Complete (≥ FY 2026)		**Total Project Cost**	
Federal	$ 39,629	Federal	$ 79,826	Federal	$ 45,399	Federal	$ 164,854
State/Local	$ 32,097	State/Local	$ 10,309	State/Local	$ 2,390	State/Local	$ 44,796
Total	**$ 71,726**	**Total**	**$ 90,135**	**Total**	**$ 47,789**	**Total**	**$ 209,650**

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board
FROM: Kanti Srikanth, TPB Staff Director
SUBJECT: Announcements and Updates
DATE: December 9, 2021

The attached documents provide updates on activities that are not included as separate items on the TPB agenda.

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board

FROM: John Swanson, TPB Transportation Planner

SUBJECT: FY 2023 Solicitation for TLC Applications

DATE: December 9, 2021

The application period for the FY 2023 round of the Transportation Land-Use Connections (TLC) Program will open on Friday, December 17, 2021. The deadline for applications is February 21, 2022. The deadline for submitting abstracts for proposed projects, which is an optional step, is January 10, 2022.

The TLC Program provides short-term consultant services to local jurisdictions for small planning projects that promote mixed-use, walkable communities and support a variety of transportation alternatives. Any local jurisdiction in the National Capital Region that is a member of the TPB is eligible to apply. Non-profits and non-member jurisdictions in the region may apply as secondary recipients to a TPB member jurisdiction. Recipients receive short-term consultant services and no direct financial assistance. Projects are eligible to receive between $30,000 and $60,000 in technical assistance for planning projects and up to $80,000 for design projects. TLC projects typically last 6-8 months.

As in past years, TLC projects may provide a range of services for community-oriented planning activities, such as:

- Small area & transit station area planning
- Bicycle and pedestrian safety & access
- Transit-oriented development studies
- Housing studies
- Economic development studies
- Roadway design guidelines & standards
- Streetscape improvement plans
- Safe Routes to School planning
- Trail planning and design
- Transit demand and feasibility analysis

The TPB encourages applications that address long-standing TPB priorities, including support for multimodal transportation options and land use enhancements in Activity Centers. This year, we are particularly interested in applications that support walking and biking improvements in high-capacity transit areas, especially Transit Access Focus Areas (TAFAs); projects to plan and design missing links in the National Capital Trail Network (NCTN); and projects that support access in Equity Emphasis Areas (EEAs).

The TPB is scheduled to approve a slate of recommended projects in April. The projects will begin in fall 2022. For more information, contact John Swanson (jswanson@mwcog.org).

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board Technical Committee

FROM: Stacy Cook, TPB Transportation Planner,
Andrew Meese, TPB Program Director, Systems Performance Planning

SUBJECT: TPB Resiliency Study: Whitepaper and Memorandum

DATE: December 9, 2021

This memorandum summarizes the TPB Resiliency Study and its completed products, including a memorandum and whitepaper, now available online on the Visualize 2045 and COG websites. This memorandum documents the purpose of the research, background on related planning efforts, the approach to TPB Technical Committee member outreach, the federal resiliency planning requirements for MPOs, and summarizes the tasks of this research project.

OVERVIEW

The purpose of this study is to advance regional planning for one of the federal Planning Factors, transportation resiliency and reliability, which is also one of TPB's policy priorities.

The primary tasks, supported by a consultant team, included:

- conducting research to document planning and capital-programming activities that the TPB member agencies and select partners are undertaking to prepare for the transportation system to be resilient in the face of natural disasters;
- identifying primary vulnerabilities to natural hazards, strategies to address these, and opportunities for regional coordination on this topic; and
- identifying potential future resiliency planning opportunities consistent with the MPO role.

BACKGROUND

As context to this effort, it should be noted that the TPB and COG are conducting or have conducted numerous efforts regarding climate change and resiliency. For the purposes of clarification, these efforts are noted below. This list is not comprehensive of all COG and TPB activities but is provided for the purpose of clarity. For more information about the studies listed here, please view the January 2021 memorandum that can be accessed online at: https://www.mwcog.org/file.aspx?&A=Uq856Jo%2f9rWyw9gxFjO9%2fHGe%2b8yQ3Jm7zbuAC0jQjBM%3d

- In 2010, the TPB joined MWCOG's action to set greenhouse gas (GHG) reduction targets to mitigate the impact of climate change.

- Over the last decade the TPB completed two studies to evaluate strategies to address these targets, including the 2010 What Would It Take scenario analysis and the 2016 Multisector Working Group study that identified the various types of projects, programs and policies that have the greatest potential to reduce GHG in the transportation sector.

- In October 2020, the COG Board approved the 2030 Regional Climate and Energy Action Plan. TPB issued a resolution endorsing the climate goals in this plan.

In 2021 the TPB advanced the following two studies.

- TPB Climate Change Mitigation Study. staff plan to conduct additional climate planning work that would examine specific strategies to develop estimates of the levels of outcomes needed to help reduce the transportation sector's GHG emissions commensurate with the region's GHG reduction goals for 2030. (Please see link above for more information)

- TPB Resiliency Study, described in this memorandum.

OUTREACH TO MEMBERS

The TPB staff reached out to TPB Technical Committee members, primarily at the state and county level for this study to gather information about transportation resiliency planning activities. This information was collected through the completion of a research framework template and a series of virtual meetings. This input is summarized in the memorandum posted online and specific examples of activities are discussed in the whitepaper.

FEDERAL REQUIREMENTS

Fixing America's Surface Transportation (FAST) Act Transportation Planning Rule (May 2016) added:

- Metropolitan Transportation Plan must assess capital investment and other strategies that reduce the vulnerability of existing transportation infrastructure to natural disasters (23 CFR450.324(f)(7)).
- MPOs recommended to consult with agencies and officials responsible for natural disaster risk reduction when developing Plan and TIP (23 CFR 450.316(b)).
- New planning factor on improving the resiliency and reliability of transportation system (23 CFR 450.206(a) and 23 CFR450.306(b)), which is:
    - Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation

Meaning of 'resilience' for the purpose of this research: As defined by the Federal Highway Administration; resilience is 'the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions'. [1]

PRIMARY STUDY TASKS

Develop a framework for documenting information

Develop a framework for documenting information about resiliency planning in the TPB planning region. This research focused on adaptation planning for natural disaster/extreme weather resiliency and stormwater mitigation activities.

[1] PowerPoint Presentation (trb-adc60.org)

The consultant collected information for each of the following TPB member transportation agencies:

- Virginia: OIPI, DRPT, VDOT
- DC: DDOT, DCOP
- MDOT including its transportation business units, MDOT MTA (MARC), MDTA and MDOT SHA.
- WMATA
- VRE
- NPS
- NCPC

Selected local jurisdictions transportation departments:

- Arlington County, VA
- City of Alexandria, VA
- Charles County, MD
- Fairfax County, VA
- Frederick County, MD
- Loudoun County, VA
- Montgomery County, MD
- Prince George's County, MD
- Prince William County, VA

Resiliency Planning Information Gathering and Documentation

The study team developed and implemented an approach and a schedule for conducting research and communicating with and gathering information from the jurisdictions. Document and summarize findings in a memorandum.

Develop Whitepaper

The study team developed a whitepaper that synthesizes the research findings, documents regional strategies for resilience, addresses equity in resiliency planning and the potential MPO role in future resilience planning efforts.

National Capital Region
Transportation Planning Board

Community Leadership Institute

DATES TO BE DETERMINED
Three Evenings in March, 2022 from 5:30 to 9:00 p.m.

PROGRAM DESCRIPTION

How are transportation decisions made in this region? How can community leaders make a difference?

The Transportation Planning Board's Community Leadership Institute (CLI) is designed to help community leaders answer those questions. Over the course of three nights, CLI aims to empower individuals to get involved in transportation decision-making whenever and wherever it occurs. CLI uses interactive group exercises and discussions to help participants better understand regional challenges, as well as opportunities for successful public involvement. At each step of the way, participants discuss ways in which the interests of their local communities connect with the planning issues facing the entire region. By providing this big-picture context, the CLI encourages participants to "think regionally and act locally."

REGISTRATION INFORMATION

The CLI is a free program consisting of three interrelated modules and interested candidates **must commit to attending all three sessions**. Interested candidates must submit a brief Statement of Interest before February 16, 2022.

The Statement of Interest can either be submitted online (www.mwcog.org/cli) or by sending an email to Bryan Hayes (bhayes@mwcog.org). The Statement of Interest must include the following information:

- Name
- State of residence
- Mailing address
- Are you affiliated with a civic association or community group?
- Please describe your recent experiences or roles in community leadership.
- Why are you interested in participating in the TPB Community Leadership Institute?
- How did you hear about the CLI?
- Please write a 1-2 sentence bio to be shared with other members of the CLI.

Statements of Interest may also be mailed to:

Bryan Hayes
Metropolitan Washington Council of Governments
777 North Capital Street, NE Suite 300
Washington, DC 20002

CLI participants represent a range of transportation interests and come from all corners of the Washington area. In order for the CLI to be successful, it is important for participants to comprise a comprehensive group that is representative of the diverse interests and geography within our region. The TPB hosts the CLI regularly, so if interested parties are unable to attend the CLI this spring, future opportunities will be available.

MORE INFORMATION

For more information on the CLI, please view the attached flier, or visit www.mwcog.org/cli .

Contact Bryan Hayes, TPB staff, at 202-962-3273 or bhayes@mwcog.org with any additional questions.

Government of the District of Columbia
Department of Transportation

d. Office of the Director

December 10, 2021

Charles Allen
Transportation Planning Board
Metropolitan Washington Council of Governments
777 North Capitol Street NE, Suite 300
Washington, DC 20002

Re: RAISE Grant Application for Benning Road Bridges and Transportation Improvements

Dear Chairman Charles Allen:

The District Department of Transportation (DDOT) would like to thank Transportation Planning Board for its support in our application for a 2021 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant to construct the Benning Road Bridges and Transportation Improvements Project. We are pleased to inform you that the application was successful and DDOT has been awarded $15 million to support the project for use before September 30, 2024.

The project will have an immediate impact on safety for pedestrians, cyclists, and drivers. Upgrading substandard sidewalks to ADA-compliance and constructing high-visibility crosswalks will improve safety for non-motorized travelers while reconfiguring the Benning Road interchange with DC-295 will improve motorist safety and mobility. The project will repair multiple bridges that are more than 50 years old, reducing maintenance and operation costs. By improving multimodal infrastructure, the project will attract more cyclists and pedestrians, helping to reduce emissions.

It was only with the great show of support from Mayor Muriel Bowser, elected officials, businesses & community groups, and residents that DDOT won this discretionary funding award. This important project will have a positive effect on quality of life for the residents of the District of Columbia by improving equitable access to transit services for historically disadvantaged communities and helping to secure Washington, DC's place as a leader in sustainable transportation.

Thank you again for your work to support this project and I look forward to future opportunities to partner in creating a safe, sustainable, and reliable multimodal transportation network.

Kind Regards,

E. Lott

Everett Lott
Acting Director

ITEM 8 – Part 1 of 2 – Action
December 15, 2021

Enhancing Regional Roadway Safety Enforcement

Action: Approve a letter from the TPB to the Governors of Maryland and Virginia and the Mayor of the District of Columbia to establish Interjurisdictional Reciprocity of Automated Enforcement Citations to Improve Regional Traffic Safety.

Background: At its November 17, 2021 meeting, the TPB considered adopting a letter from the TPB to the executives of the District of Columbia, Maryland and Virginia urging them to work together to establish a reciprocal agreement among the three jurisdictions on enforcing traffic citations issued by automated traffic enforcement (ATE) devices. The board decided to take time to allow members to suggest changes that would ensure that interests /concerns of the local jurisdictions would be considered in the process. With input from many members, a revised letter will be reviewed, and the board's approval sought.

National Capital Region
Transportation Planning Board

December 15, 2021 – **DRAFT**

The Honorable Muriel Bowser, Mayor, District of Columbia
The Honorable Larry Hogan, Governor, State of Maryland
The Honorable Ralph Northam, Governor, Commonwealth of Virginia

Re: Establishing Interjurisdictional Reciprocity of Automated Enforcement Citations to Improve Regional Traffic Safety

Dear Mayor Bowser, Governor Hogan, and Governor Northam:

I am writing on behalf of the National Capital Region Transportation Planning Board (TPB) at the Metropolitan Washington Council of Governments (COG), to urge your proactive involvement to establish interjurisdictional reciprocity for citations issued by automated traffic safety enforcement systems across the District of Columbia, Maryland, and Virginia.

As the federally-designated metropolitan planning organization (MPO) for Washington, D.C., Suburban Maryland, and Northern Virginia, the TPB has the responsibility under the provisions of the Fixing America's Surface Transportation (FAST) Act for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process for the metropolitan area, with roadway safety being a key responsibility.

The FAST Act mandates MPOs like the TPB to gather and analyze transportation safety data within a Performance-Based Planning and Programming (PBPP) process, and, working with the state transportation safety offices of the District, Maryland, and Virginia, annually adopt regional targets for roadway fatalities and serious injuries. Your state safety officials have been cooperating with and supporting the TPB in its efforts to reduce roadway fatalities and serious injuries through the development and implementation of proven effective safety countermeasures at the state, regional, and local levels, and the TPB thanks you and them for their assistance and support.

However, these PBPP responsibilities have led to sobering discussions by the TPB regarding the unacceptably high numbers of fatalities and serious injuries on the region's roadways which is contrary to the TPB's vision and the region's aspirations. These discussions have led to an increased focus by the TPB on roadway safety, notably spelled out in TPB Resolution R3-2021 (July 22, 2020). This resolution establishes a Regional Roadway Safety Policy and includes associated Roadway Safety and Equity Policy Statements describing the TPB's commitment to reduce fatalities and serious injuries on the region's roadways in a fair and equitable manner. The resolution also established a Regional Roadway Safety Program to assist TPB member jurisdictions and agencies to identify and implement evidence-based roadway safety countermeasures. We appreciate the involvement and support your agencies have provided to this new program. TPB Resolution R3-2021 includes a list of dozens of recommended engineering, education, and enforcement strategies and countermeasures that can, if implemented, significantly reduce the number of people killed or seriously injured throughout the region. The use of appropriately designed automated traffic safety enforcement is one of the evidence-based countermeasures listed in the resolution.

Enforcement is a critical strategy, especially as a means to communicate that there will be consequences for dangerous driving behaviors. The TPB understands that the existing Driver License Compact, of which all three jurisdictions are members, allows for reciprocity across state lines for

traffic moving violations as traditionally issued by law enforcement personnel in the field, but such legal reciprocity does not currently include citations issued by automated traffic enforcement devices.

Appropriately designed, data-driven automated enforcement systems have had success in many parts of the nation in improving safety outcomes for speeding, red light running, and other infractions that states and the District may choose to enforce through automated enforcement systems. But the high levels of cross-boundary driving in the National Capital Region, combined with the lack of interjurisdictional reciprocity for automated traffic enforcement penalties, has resulted in fewer drivers being held accountable for their dangerous driving behaviors, thereby diminishing this strategy's effectiveness.

Given the evidence supporting the effectiveness of appropriately designed automated enforcement systems in improving safety outcomes, plus the unacceptably high levels of fatalities and serious injuries on the region's streets and roads, the TPB urges you to work collaboratively to create a multijurisdictional safety taskforce to work toward an agreement on reciprocity for automated traffic enforcement citations issued across the District of Columbia, Maryland, and Virginia, as a critical step toward reducing roadway fatalities and serious injuries in each of your states, and our region. As part of the taskforce's work, it will be important to recognize that automated enforcement is evolving differently in each jurisdiction and that reciprocity should prioritize enforcement for citations that are most directly tied to road safety. TPB further recommends that this safety taskforce among the District of Columbia, Maryland, and Virginia also review existing traffic laws and criteria for automated enforcement, and make recommendations for potential legislative action that will allow for consistency in meeting our region's safety goals; this may be an area where the TPB staff and members could provide support.

I express the sense of the entire board when I say that the TPB stands ready to support your activities in this regard and in advancing a continuing, cooperative, and comprehensive metropolitan transportation planning process. Please feel free to contact TPB Director Kanathur (Kanti) Srikanth of any member of our board for assistance in advancing this critical goal for the region's transportation system.

Sincerely,

Charles Allen
TPB Chairman

cc: Everett Lott, Acting Director, District Department of Transportation
Gregory Slater, Secretary, Maryland Department of Transportation
Shannon Valentine, Secretary, Virginia Department of Transportation
Kanathur N Srikanth, Director, Transportation Planning Board

ITEM 8 – Part 2 of 2 – Information
December 15, 2021

Summary of Automated Traffic Enforcement Deployment in the TPB Membership Area

Action: Review background information for the board's discussion of a letter regarding Automated Traffic Enforcement (ATE) interjurisdictional reciprocity.

Background: At its November 17, 2021 meeting, the TPB considered adopting a letter from the TPB to the executives of the District of Columbia, Maryland and Virginia urging them to work together to establish a reciprocal agreement among the three jurisdictions on enforcing traffic citations issued by ATE devices, with a decision to revisit to topic at the December 15 meeting. As part of that discussion, the board asked staff in the meantime to compile summary information on ATE deployment among TPB member agencies and jurisdictions. Attached as background information for the reciprocity letter discussion is a summary of ATE deployment in the TPB membership area, as requested.

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board

FROM: Andrew Meese, TPB Program Director, Systems Performance Planning
C. Patrick Zilliacus, TPB Transportation Engineer

SUBJECT: Summary of Automated Traffic Enforcement Deployment in the TPB Membership Area

DATE: December 9, 2021

This memorandum provides a summary of Automated Traffic Enforcement (ATE) deployment in the TPB membership area, following a request at the November 17, 2021 TPB meeting for this information. The focus of the information contained herein is on systems as deployed in the region according to information gathered through staff desk research, with general information on legal enabling of or restrictions on deployments of such devices.[1]

ABOUT AUTOMATED TRAFFIC ENFORCEMENT

Automated Traffic Enforcement (ATE) generally involves use of an electronic camera to enforce traffic laws by assisting with detection of infractions and providing photo documentation of the vehicle or driver violating the traffic law. Two of the most common types of automated enforcement systems are red-light cameras and automated speed enforcement cameras.[2] There are other less common use cases, including some additional use cases in the National Capital Region, described below. Devices may be permanently installed at locations, or portable, and many jurisdictions use a combination of fixed and portable devices.

OVERVIEW OF AUTOMATED TRAFFIC ENFORCEMENT IN THE REGION

ATE systems to cite red light runners and speeders are deployed in the District of Columbia (on D.C.-maintained roads only), as well as in many TPB-member cities and counties in Maryland and Virginia, plus in some Maryland municipalities that are not members of the TPB.

In addition to enforcement of speed limits and traffic signal red lights, D.C. uses automated enforcement to identify overheight commercial vehicles and stop sign violators. ATE does not appear to be deployed on streets, parkways and other roads under direct control of federal government agencies (generally the National Park Service, the U.S. Department of Agriculture, the Department of Defense and the Architect of the Capitol). In Virginia, the Metropolitan Washington Airports Authority (MWAA) is authorized to use ATE to identify illegal users of the Dulles Access Highway and issue summonses to violators.

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[1] No information in this memorandum constitutes a legal review or finding.
[2] This definition adapted from "Research Brief: An Overview of Automated Enforcement Systems and Their Potential for Improving Pedestrian and Bicyclist Safety", Pedestrian and Bicycle Information Center, Chapel Hill, North Carolina, www.pedbikeinfo.org, undated.

CONDITIONS AND REQUIREMENTS FREQUENTLY ASSOCIATED WITH AUTOMATED TRAFFIC ENFORCEMENT

Use of and restrictions on ATE are set forth in a variety of District of Columbia, Maryland, and Virginia state laws. These laws, including the delegation of implementation authority, vary between the three "states" and among the localities.

Conditions and requirements for speed ATE may differ on a case-by-case basis among the localities in this region, but frequently include:

- Limited to school zones or highway work zones (there are some exceptions);
- Approval by a state agency for a local government to install ATE on a state-maintained road is required;
- Speed tolerances set by law;
- Monetary penalties set by law;
- Days of week and hours of operation may be specified or limited by law;
- Signage requirements approaching a segment of road monitored by ATE;
- Speed measuring equipment must be calibrated and then recalibrated regularly;
- Speeding violations detected by ATE are generally not considered moving violations; are not entered on driving records and do not carry "points;"
- Private contractors may operate ATE on behalf of a jurisdiction or agency subject to conditions imposed by law;
- The number of devices deployed within a jurisdiction may be limited by law; and
- In some jurisdictions any trained person may review and certify ATE speeding violations, in other jurisdictions this must be done by a sworn law enforcement officer.

Conditions and requirements for red light ATE may differ on a case-by-case basis among the localities in this region, but frequently include:

- Agency that controls the signal must verify that the yellow phase duration is long enough to comply with regulations or standards;
- Traffic signal must be properly installed;
- Monetary penalties set by law;
- Private contractors may operate and administer some aspects of a red signal ATE system on behalf of a jurisdiction or agency;
- The number of devices deployed within a jurisdiction may be limited by law; and
- Red light violations detected by ATE are generally not considered moving violations; are not entered on driving records and do not carry "points."

JURISDICTIONAL SUMMARY OF AUTOMATED TRAFFIC ENFORCEMENT DEPLOYMENTS

Table 1 shows a summary of ATE deployments in TPB member jurisdictions as per TPB staff desk research conducted in November 2021. Information has been kept at a general level for clarity. The summary lists whether each jurisdiction has speed cameras, red light cameras, or both, with notes

for additional use cases: stop sign running and overheight vehicle enforcement in the District of Columbia, and enforcement of bus-only slip ramps between the Dulles Toll Road and the Dulles Access Highway. Also shown is whether the responsible implementing public agency is a law enforcement agency or a transportation agency.

ATE is currently deployed in some form in all but six TPB member jurisdictions (additionally, ATE is deployed in Frederick County only by and within the municipal limits of Thurmont), plus by the Maryland Department of Transportation in work zones, and (as noted above) by the Metropolitan Washington Airports Authority along the Dulles Access Highway.

Staff welcomes feedback for any deployment or related fact that may not have been uncovered in our desk research. Please contact ameese@mwcog.org with corrections or comments.

Table 1: Summary of Automated Traffic Enforcement Deployment in the National Capital Region
(Source: COG/TPB staff compilation, November 2021)

JURISDICTION	DEVICES DEPLOYED?		TYPE		RESPONSIBLE PUBLIC AGENCY	NOTES
	YES	*NO*	*SPEED*	*RED LIGHT*		
District of Columbia	✓		✓	✓	DDOT	On D.C. maintained streets only. Note: automated traffic enforcement also deployed for stop sign running and overheight vehicles.
Maryland						
Charles County	✓		✓	✓	Law Enf. Agy.	
Frederick County	Note				Law Enf. Agy.	Only within corporate limits of one or more non-TPB member jurisdictions (speed cameras)
Montgomery County	✓		✓	✓	Law Enf. Agy.	Also within corporate limits of one or more non-TPB member jurisdictions (speed cameras)
Prince George's County	✓		✓	✓	Law Enf. Agy.	Also within corporate limits of one or more non-TPB member jurisdictions (speed cameras)
City of Bowie	✓		✓		Law Enf. Agy.	
City of College Park	✓		✓		Law Enf. Agy.	
City of Frederick	✓		✓	✓	Law Enf. Agy.	
City of Gaithersburg	✓		✓		Law Enf. Agy.	
City of Greenbelt	✓		✓	✓	Law Enf. Agy.	
City of Laurel	✓		✓	✓	Law Enf. Agy.	
City of Rockville	✓		✓		Law Enf. Agy.	
City of Takoma Park	✓		✓		Law Enf. Agy.	
Maryland Department of Transportation	✓		✓		MDOT	Permitted for work zones on state highways and MDTA roadways (speed cameras)
Virginia						
Arlington County	✓			✓	Law Enf. Agy.	
Fairfax County		✓				
Loudoun County		✓				
Prince William County		✓				
City of Alexandria	✓			✓	Law Enf. Agy.	
City of Fairfax	✓		✓	✓	Law Enf. Agy.	
City of Falls Church		✓				
City of Manassas	✓			✓	Law Enf. Agy.	
City of Manassas Park		✓				
Urbanized area around Warrenton in Fauquier County		✓				
Metro. Washington Airports Authority	Note				Law Enf. Agy	Enforcement of bus-only slip ramps onto the Dulles Access Highway

Version of December 9, 2021

ITEM 9 – Action
December 15, 2021

Regional Roadway Safety Program Project Approvals

Action: Approve Regional Roadway Safety Program technical assistance recipients.

Background: Staff solicited applications for the second round of Regional Roadway Safety Program technical assistance between August 16 and October 12, 2021. The board will be briefed and asked to approve the applications that are being recommended for funding in FY 2022.

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board

FROM: Jon Schermann, Transportation Planner

SUBJECT: FY 2022 Regional Roadway Safety Program Technical Assistance Funding Recommendations

DATE: December 9, 2021

This memo provides information on the recommendations of the Selection Panel for the second round of technical assistance under the Regional Roadway Safety Program (RRSP). The panel met in November and recommended five projects for funding. The TPB is scheduled to vote on the panel's recommendations on December 15.

FUNDING RECOMMENDATIONS FOR FY 2022

A total of $250,000 in FY 2022 Unified Planning Work Program (UPWP) funding was authorized for the Regional Roadway Safety Program. The RRSP Selection Panel recommends five projects for funding.

The recommended slate of projects supports the key TPB safety priorities:

- All projects address one or more of the funding priorities outlined in TPB Resolution R3-2021.
- All projects either directly or indirectly encourage improved road user behavior.
- Three of the five projects work to identify and/or design safety countermeasures.
- All projects are intended to equitably improve safety outcomes for all roadway users.

Projects recommended for funding:

Planting Seeds for Regional Roadway Safety, One Traffic Garden at a Time

Arlington and Prince George's Counties, $35,000

Project seeks consultant services to create traffic garden layout and tool kits that provide templates for implementation of school-based traffic gardens. Traffic gardens are small-scale street networks that provide a safe space for children to practice active transportation.

Improving the Capabilities and Availability of a "Pedestrian and Cyclist Safety Analytics Application"

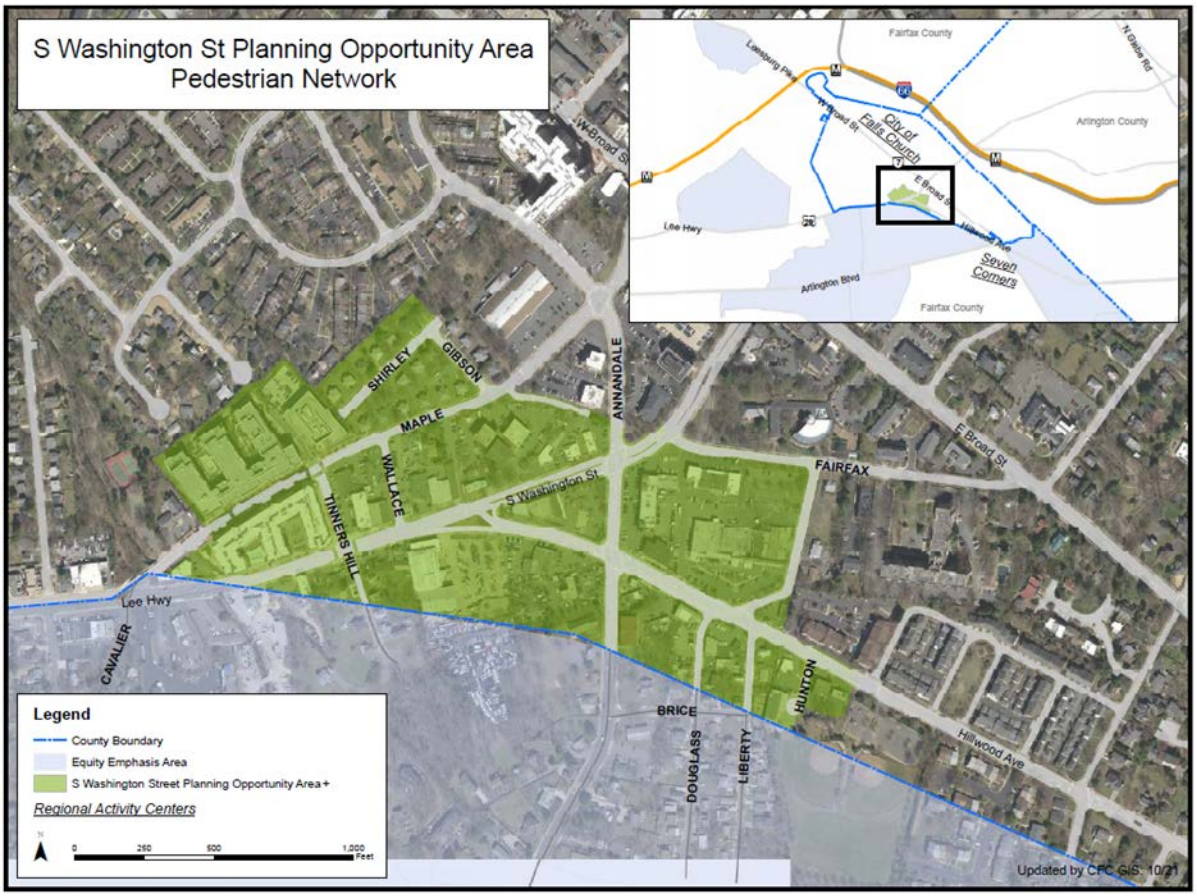
City of Alexandria, $45,000

Project, which is a partnership between the City of Alexandria and NOVA Families for Safe Streets, seeks to improve an existing near miss reporting tool by incorporating analytics that provide correlation between Virginia TREDS crash data and near miss data. The project also seeks to develop a smartphone app for the tool.

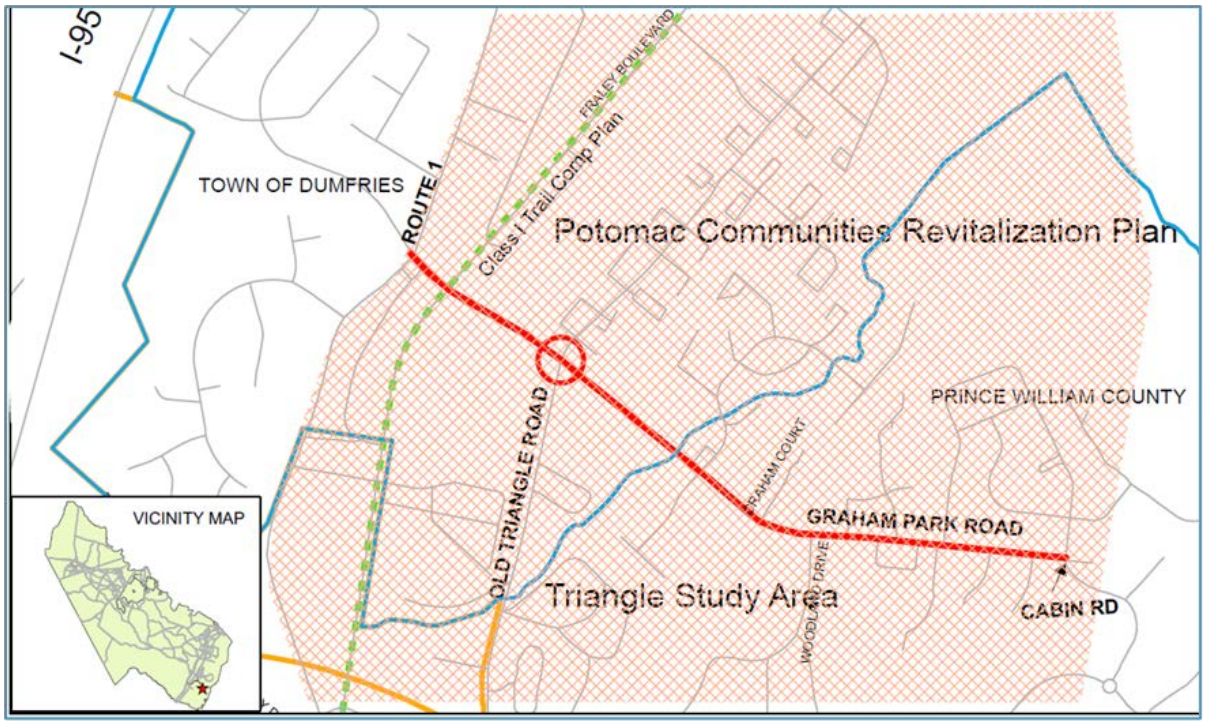
S. Washington Street Planning Opportunity Area Pedestrian Network

City of Falls Church, $50,000

This project will conduct a study of the existing pedestrian network for the City's South Washington Street Corridor Planning Opportunity Area (43.3 acres) to identify; missing pieces of the pedestrian network, intersection geometric improvements, areas for improved lighting and pedestrian countdown signals, and areas that could benefit from traffic calming measures. The study area is shown in the map below.



Graham Park Road Safety Improvements Road Diet and Roundabout
Prince William County, $60,000
This project seeks to provide preliminary engineering for a four-to-two lane road diet along Graham Park Road and a roundabout at its intersection with Old Triangle Road. The project area is shown in the map below.



Harrison Lane Corridor Pedestrian Improvements
Fairfax County, $60,000
This project seeks to identify and design pedestrian treatments at four intersections along the Harrison Lane Corridor to improve pedestrian safety and slow vehicle speeds. The project area is shown in the map below.

APPLICATION PROCESS

On August 16, 2021, the TPB issued a call for projects for the second round (FY 2022) of Regional Roadway Safety Program technical assistance. The deadline for application submissions was October 12, 2021. Applicants were invited to submit optional abstracts which provided them an opportunity for TPB staff to review project concepts and provide feedback on how to develop stronger applications.

Like the TLC program, technical assistance was offered in amounts between $30,000 and $60,000 for planning projects, and up to $80,000 for 30% design projects. The Call for Projects and the application form itself placed a focus on TPB priorities, including those described in TPB Resolution R3-2021.

The TPB received six applications (one from a Maryland jurisdiction, four from Virginia jurisdictions, and one joint application from Arlington and Prince George's Counties) totaling $395,000 in funding requests for this round. $250,000 is authorized.

This includes three funding sources:

- $150,000 from the TPB's FY 2022 UPWP core regional planning funds
- $35,000 of Maryland UPWP Technical Assistance
- $35,000 of Virginia UPWP Technical Assistance
- $30,000 of District of Columbia UPWP Technical Assistance

SELECTION PROCESS

The selection panel included the following members:

- Tim Kerns, Maryland Highway Safety Office
- Azadeh Norouzi, District Department of Transportation
- Stephen Read, Virginia Department of Transportation
- Jon Schermann, COG/TPB staff

The selection panel met on November 30 to review the project applications and develop a list of recommended projects for this round of technical assistance. The selection panel applied TPB funding priorities as well as their own extensive knowledge of roadway safety to assess the proposed projects. The selection panel members individually reviewed and scored each application in advance of the meeting and then used their scores to assign each application a high, medium, or low score. The rankings served as a starting point for the panel's collective discussion.

Based upon a consensus developed at the November 30 meeting, the selection panel developed a list of five projects to recommend to the TPB for approval. The panel believes this package of projects will result in safety improvements, including fewer deaths and injuries.

In some cases, the panel chose to award funding at lower levels than the applications requested. These changes were made in accordance with information on scalability provided in the applications.

PROPOSED PROJECT COMPLETION TIMELINE

On December 15, 2021, the TPB will be asked to approve the proposed slate of five projects for technical assistance funding under the FY 2022 Regional Roadway Safety Program. Upon approval of the projects, TPB staff will begin to coordinate with the jurisdictions to begin the consultant selection process from a pre-qualified list of consultants. All projects will begin soon after consultant contracts are signed. The projects will be scheduled for completion by October 31, 2022.

For further questions regarding the Regional Roadway Safety program, contact Jon Schermann (jschermann@mwcog.org; 202-962-3317).

REGIONAL ROADWAY SAFETY PROGRAM

FY 2022 Technical Assistance

Jon Schermann
Transportation Planner

TPB Technical Committee
December 15, 2021

Agenda Item 9

National Capital Region
Transportation Planning Board

Regional Roadway Safety Program

- Second round
- Established and funded by the TPB via Resolution R3-2021 adopted July 2021
- Promotes TPB roadway safety priorities
- Program Funding (FY 2021)
  - Core UPWP: $150,000
  - Maryland Technical Assistance: $35,000
  - Virginia Technical Assistance: $35,000
  - District of Columbia Technical Assistance: $30,000
  - **Total Program Funding: $250,000**

Solicitation

- Application solicitation between August 16 – October 12, 2021
  - Optional abstracts were due September 10
- 6 applications were received for $395,000 in funding requests
  - One application from a Maryland jurisdiction, four applications from Virginia jurisdictions, and one joint application (from Arlington and Prince George's Counties)

Selection

- Selection Panel
  - TPB staff + safety officials from DDOT, MDOT, and VDOT
  - Individual Evaluations

- Discussion: consensus recommendations

Overview of Recommendations

- Total funding: $250,000
- 5 applications recommended for funding
  - All projects address one or more of the funding priorities outlined in TPB Resolution R3-2021
  - All projects either directly or indirectly encourage improved road user behavior
  - Three of the five projects work to identify and/or design safety countermeasures
  - All projects are intended to equitably improve safety outcomes for all roadway users
  - Four projects are from Virginia jurisdictions, and one is collaboration between Arlington and Prince George's County

Selection Panel Funding Recommendations

Jurisdiction Name	Project	Request	Panel Recommendation
Arlington County / Prince George's County	Planting Seeds for Regional Roadway Safety, One Traffic Garden at a Time	$35,000	**$35,000**
City of Alexandria	Improving the Capabilities and Availability of a "Pedestrian and Cyclist Safety Analytics Application"	$60,000	**$45,000**
City of Falls Church	S. Washington Street Planning Opportunity Area Pedestrian Network	$60,000	**$50,000**
Prince William County	Graham Park Road Safety Improvements Road Diet and Roundabout	$80,000	**$60,000**
Fairfax County	Harrison Lane Corridor Pedestrian Improvements	$80,000	**$60,000**
Total			**$250,000**

Next Steps

- Begin consultant selection process in January
- Open the third round (FY 2023) application period in January

Jon Schermann

Transportation Planner
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National Capital Region
Transportation Planning Board

ITEM 10 – Information
December 15, 2021

PBPP: Draft 2018 – 2022 Highway Safety Targets

Background: The board will be briefed on the proposed 2018-2022 targets for highway safety performance measures as part of federal Performance Based Planning and Programming (PBPP) requirements. Board action is anticipated in January.

TPB R7-2022
January 19, 2022

NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD
777 North Capitol Street, N.E.
Washington, D.C. 20002

DRAFT RESOLUTION TO ADOPT ANNUAL HIGHWAY SAFETY TARGETS FOR THE NATIONAL CAPITAL REGION

WHEREAS, the National Capital Region Transportation Planning Board (TPB) has been designated by the Governors of Maryland and Virginia and the Mayor of the District of Columbia as the Metropolitan Planning Organization (MPO) for the Washington Metropolitan Area; and

WHEREAS, safety of all modes of travel is an important element of TPB's Vision, and a regional priority, with many of its member jurisdictions having adopted aspirational safety goals associated with Vision Zero and Towards Zero Deaths; and

WHEREAS, the provisions of the FAST Act continued the implementation of performance-based planning and programming to achieve desired performance outcomes for the multimodal transportation system, including the setting of targets for future performance by States and metropolitan planning organizations (MPOs); and

WHEREAS, the Federal Highway Administration issued a rulemaking for state departments of transportation (DOTs) and MPOs to annually establish data-driven highway safety targets and report progress on achieving the targets for the following performance measures: number of fatalities, rate of fatalities per hundred million vehicle miles traveled (VMT), number of serious injuries, rate of serious injuries per VMT, and number of combined non-motorized fatalities and non-motorized serious injuries; and

WHEREAS, though the federal regulations that designate the safety performance measures refer to them as the *National Performance Management Measures for the Highway Safety Improvement Program*, the performance measures are applicable to <u>all</u> public roads in the region from community streets to Interstate highways, and can properly be referred to as <u>roadway</u> safety targets; and

WHEREAS, the TPB has reviewed the safety performance measures and established data-driven regional safety targets annually since January 2018 and acknowledges that the number of fatalities and serious injuries on the region's roadways are unacceptably high, which is contrary to its own vision and the region's aspirations; and

WHEREAS, the TPB remains focused on acting on its priorities and achieving the region's aspirational goals of zero fatalities and serious injuries on its roadways and is using the federally required annual regional highway safety targets and the process to evaluate the region's progress toward zero roadway deaths; and

WHEREAS, the TPB commissioned a regional roadway safety study to identify the factors contributing to and the predominant types of fatal and serious injury crashes in the region and recommend projects, programs and policies the region should prioritize to improve safety outcomes on the region's roadways; and

WHEREAS, The TPB has reviewed the findings of that study and adopted Resolution R3-2021 titled, "Resolution to Establish A Regional Roadway Safety Policy, and Associated Roadway Safety and Equity Policy Statements, to Reduce Fatalities and Serious Injuries on the National Capital Region's Roadways" based on those findings; and

WHEREAS, the TPB, as described in Resolution R3-2021, urges its members to reaffirm road user safety as a top priority and prioritize the implementation of projects, programs, and policies, in an equitable and non-racist manner, consistent with the TPB's Equity Policy statement, that strive to reduce the number of fatal and serious injury crashes on the Region's roadways; and

WHEREAS, The TPB has, as part of Resolution R3-2021, established and funded a Regional Safety Program to assist its members to develop and/or implement projects, programs, or policies to equitably improve safety outcomes for all roadway users; and

WHEREAS, the TPB continues to support local, regional, and state level efforts to reduce fatalities and serious injuries concurrent with the development of increasingly aggressive highway safety targets in the future; and

WHEREAS, the DOTs of the District of Columbia, Maryland, and Virginia set their respective highway safety targets for the five-year period 2018 through 2022 by August 31, 2021, and MPOs are required to set highway safety targets for their metropolitan planning areas for the same period by February 28, 2022; and

WHEREAS, TPB staff have coordinated with officials at the Maryland Department of Transportation (MDOT), the Virginia Department of Transportation (VDOT), and the District Department of Transportation (DDOT) to develop regional highway safety targets that are evidence based, consistent with the targets submitted by each member state DOT, and reflective of the outcomes expected through the implementation of funded safety projects and policies; and

WHEREAS, these highway safety targets have been reviewed and recommended for TPB approval by the Transportation Safety Subcommittee and the TPB Technical Committee; and

WHEREAS, the TPB requests that its members continue to coordinate and share information on projects, programs, policies, and initiatives to improve safety.

NOW, THEREFORE, BE IT RESOLVED THAT the National Capital Region Transportation Planning Board adopts the following set of highway safety targets for the National Capital Region, as described below.

Table 1: Regional Highway Safety Targets – 2018-2022 Average

Performance Measure	2018-2022 Target
Number of Fatalities *(5 year rolling average)*	253.0
Rate of Fatalities per 100 million VMT *(5 year rolling average)*	0.588
Number of Serious Injuries *(5 year rolling average)*	1,889.7
Rate of Serious Injuries per 100 million VMT *(5 year rolling average)*	3.867
Number of Non-Motorized Fatalities and Serious Injuries *(5 year rolling average)*	508.6

DRAFT REGIONAL HIGHWAY SAFETY TARGETS

Performance-Based Planning and Programming

December 2021

DRAFT 2018-2022 REGIONAL HIGHWAY SAFETY TARGETS, DECEMBER 2021
November 22, 2021

ABOUT THE TPB
The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 24 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

CREDITS
Editor: Jon Schermann
Design: COG Communications Office

ACKNOWLEDGEMENTS (OPTIONAL)
Jurisdictional agency staff from across the region.

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REGIONAL HIGHWAY SAFETY TARGETS

This report proposes a set of draft regional highway safety performance targets for the 2018-2022 time period that meet the MAP-21/FAST performance-based planning and programming (PBPP) requirements and are consistent with the target setting approaches of Maryland, Virginia, and the District of Columbia.

Overview of Recent Transportation Planning Board Safety Activities

The Transportation Planning Board (TPB) adopted the first set of highway safety targets for the National Capital Region in January of 2018. Since then, the TPB has devoted considerable effort to; 1) better understand the factors driving the unacceptably high numbers of fatal and serious injury crashes in the region, 2) identify countermeasures and strategies that are proven to be effective in reducing fatal and serious injury crashes, and 3) encourage TPB member jurisdictions and agencies to implement countermeasures and strategies to significantly reduce fatalities and serious injuries on the region's roadways.

Progress was made in each of these areas over the past two years. In the spring of 2020, the TPB reviewed the findings of a regional crash data analysis and considered the recommendations resulting from a consultant-led regional safety study that began in 2019. This work led to the adoption of a major safety resolution during the TPB's July 2020 meeting. A key element of this resolution is the establishment of the Regional Roadway Safety Program (RRSP) to assist member jurisdictions and the region to develop and/or implement projects, programs, or policies to equitably improve safety outcomes for all roadway users. In June 2021 the TPB approved and funded the first five projects for the RRSP and will soon approve an additional set of RRSP projects.

The TPB anticipates that the RRSP, combined with the continued safety improvement efforts of member agencies and jurisdictions, will result in improved performance that will be reflected in the federally required regional safety performance measures in future years.

Overview of Performance-Based Planning and Programming Requirements

Under the Moving Ahead for Progress in the 21st Century Act (MAP–21) and reinforced in the Fixing America's Surface Transportation (FAST) Act, federal surface transportation regulations require the implementation of performance management requirements through which states and metropolitan planning organizations (MPOs) will "transition to a performance-driven, outcome-based program that provides for a greater level of transparency and accountability, improved project decision-making, and more efficient investment of federal transportation funds."

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) have issued a set of rulemakings for the implementation of this performance-based planning and programming (PBPP) process. Each rulemaking lays out the goals of performance for a particular area of transportation, establishes the measures for evaluating performance, specifies the data to be used to calculate the measures, and sets requirements for the setting of targets.

Under the PBPP process, states, MPOs, and providers of public transportation must link investment priorities to the achievement of performance targets in the following areas:

- Highway Safety;
- Highway Assets: Pavement and Bridge Condition;
- System Performance (Interstate and National Highway System, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program); and
- Transit Safety and Transit Asset Management.

Although the federal regulations that designate the safety performance measures refer to them as the *National Performance Management Measures for the Highway Safety Improvement Program*, the performance measures are applicable to all public roads in the region from community streets to Interstate highways and can properly be referred to as roadway safety targets.

Highway Safety Targets: Setting, Coordinating, and Reporting

The expectation of the implementation of the Safety Performance Measure rule is to improve both the quantity and quality of safety data, with respect to data pertaining to serious injuries and fatalities. This implementation will also allow greater transparency by disseminating the data publicly. In addition, aggregation of targets and progress at the national level will become possible through improved data consistency among the states and MPOs.

State DOTs and MPOs are expected to use the information generated by these regulations to make investment decisions that result in the greatest possible reductions in fatalities and serious injuries. The five required safety performance measures, along with proscribed data sources, are outlined in Table 1 on the next page.

Table 1: Highway Safety Performance Measures Summary

Performance Measure	Description	Data Source
Number of Fatalities *(5 year rolling average)*	Total number of fatalities during a calendar year	FARS[1]
Rate of Fatalities per 100 million VMT *(5 year rolling average)*	Ratio of total fatalities to VMT	FARS and HPMS[2] (or MPO estimate)
Number of Serious Injuries *(5 year rolling average)*	Total number of serious injuries during a calendar year	State reported serious injury data
Rate of Serious Injuries per 100 million VMT *(5 year rolling average)*	Ratio of total serious injuries to VMT	State reported serious injury data and HPMS
Number of Non-Motorized Fatalities and Serious Injuries *(5 year rolling average)*	Total number of fatalities and serious injuries during a calendar year	FARS and State serious injury data

[1] FARS: Fatality Analysis Reporting System
[2] HPMS: Highway Performance Monitoring System

TARGET SETTING

States and MPOs must fulfill the target setting requirements of the final rule. State DOTs are required to set statewide numerical targets for each of the five performance measures. Targets for the first three performance measures (number of fatalities, rate of fatalities, and number of serious injuries) must be identical to the targets set by the State Highway Safety Office (SHSO). Each target must also represent the anticipated performance outcome for all public roadways in the state, regardless of ownership. A breakdown of responsibilities for target setting are listed below.

State DOTs:

- Required to set statewide numerical targets for each of the five performance measures:
  - Each of these targets must be identical to those set by the State Highway Safety Office (SHSO).
  - Each target shall represent anticipated performance outcome for all public roadways in the State, regardless of ownership.
  - Targets cannot be changed after they are reported.

MPOs:

- For each performance measure, an MPO can either:
    - Agree to plan and program projects so they contribute toward accomplishing the state DOT safety target for that performance measure, or
    - Set a quantifiable target for that performance measure for the MPO planning area:
        - Each target should represent anticipated performance outcome for all public roadways in the MPO planning area, regardless of ownership.
        - MPOs should coordinate with the state DOT(s) to ensure consistency.

MPO Coordination with State DOTs

MPOs are required to establish data-driven and realistic performance targets in coordination with their state partners. MPOs and their state partners should work together to share data, review strategies, and understand outcomes.

Target Reporting

State DOTs report their targets to the FHWA within the state's HSIP (Highway Safety Improvement Program) annual report due each year on August 31.

MPOs do not report their targets to the FHWA, but rather to their respective state DOTs in a manner that is documented and mutually agreed upon. MPOs also report progress toward achieving their targets within the "System Performance Report" portion of their long-range transportation plan (Visualize 2045). In addition, MPO TIPs must include a discussion of how the implementation of the TIP will further the achievement of the targets.

FHWA Determination of Significant Progress

States do not have to meet each of their safety targets to avoid the consequences outlined in the rule but must either meet the target or make significant progress toward meeting the target for four of the five performance measures. The FHWA determines that the significant progress threshold is met if the performance measure outcome is better than the "baseline" – which is defined as the 5-year rolling average for that performance measure for the year prior to the establishment of the target. MPO targets are not evaluated by the FHWA.

Consequences for Failing to Meet Targets of Making Significant Progress

State DOTs that have not met or made significant progress toward meeting their safety performance targets lose some flexibility in how they spend their HSIP funds and are required to submit an annual implementation plan that describes actions the DOT will take to meet their targets.

There are no consequences outlined in the rule for MPOs not meeting their targets. However, the FHWA will review how MPOs are incorporating and discussing safety performance measures and targets in their long-range transportation plans and TIPs during MPO certification reviews.

RECENT TRENDS IN SAFETY DATA

Last year's TPB-adopted targets for the 2017-2021 period were set before calendar year 2020 safety data were available. These data have now been released and are shown in Table 2 below.

Table 2: National Capital Region Safety Trends – with Final 2020 Annual Data

	2016	2017	2018	2019	2020	Change from 2019 to 2020
# of Fatalities	279	313	303	306	321[1]	↑ 4.9 %
Fatality Rate (per 100 MVMT)	0.633	0.695	0.673	0.673	0.876[1]	↑ 30.2 %
# of Serious Injuries	2,916	2,592	2,464	2,371	1,842	↓ 22.3 %
Serious Injury Rate (per 100 MVMT)	6.614	5.755	5.473	5.211	5.026	↓ 3.6 %
# Nonmotorist Fatalities & Serious Injuries	553	580	551	595	440	↓ 26.1 %

Fatalities increased nearly 5 percent between 2019 and 2020 which, combined with the dramatic reduction in VMT associated with the COVID pandemic, drove the fatality rate (per VMT) higher by 30.2 percent over the same period. The number of serious injuries fell over 22 percent while the rate of serious injuries declined by a more modest 3.6 percent. The number of nonmotorist fatalities plus serious injuries, driven by the dramatic reduction in overall serious injuries, decreased by 26.1 percent between 2019 and 2020.

PROGRESS TOWARDS THE 2016-2020 SAFETY TARGETS

Table 3 (next page) shows the region's performance on the five safety performance measures with respect to the 2016-2020 targets set in January of 2019.

Table 3: 2016-2020 Actuals vs. Targets

Performance Measure (5-year rolling average)	2016-2020 Actual	2016-2020 Target	Status
# of Fatalities	304.4[1]	253.0	Not met
Fatality Rate (per 100 MVMT)	0.704[1]	0.588	Not met
# of Serious Injuries	2,437.0	2,692.1	Met
Serious Injury Rate (per 100 MVMT)	5.616	6.157	Met
# Nonmotorist Fatalities & Serious Injuries	555.5	508.6	Not met

Note [1]: Figures listed are from state fatality data; official 2019 Fatality Analysis Reporting System data are not yet published

As shown above, the region has met the 2016-2020 targets for the number of serious injuries and the serious injury rate performance measures. However, the region did not meet the targets set for the number of fatalities, the number of nonmotorist fatalities and serious injuries, and the fatality rate targets.

NCR REGIONAL SAFETY TARGET SETTING APPROACH

This year, a new set of targets for the five safety performance measures will be adopted. These targets will be for the 2018-2022 period. The methodology used to develop these targets is the same as the process used last year and leverages the approaches used by our state DOT partners. To account for and incorporate the different target setting approaches used by Maryland, Virginia, and the District of Columbia to develop targets for the entire National Capital Region (NCR), staff applied the following methodology to develop the proposed draft targets:

- identify a "sub-target" for the Maryland portion of the NCR by applying MDOT's target setting approach to the safety data for the Maryland portion of the NCR;
- identify a "sub-target" for the Virginia portion of the NCR by applying VDOT's suggested MPO target setting methodology to the safety data for the Virginia portion of the NCR;
- identify a "sub-target" for the District of Columbia portion of the NCR by directly incorporating DDOT's targets;
- combine the three sub-targets mathematically into a set of initial regional targets;
- compare each performance measure's sub target with the corresponding target set last year; and
- select the lower (more aggressive) of the two targets as this year's target.[1]

[1] This ensures that none of this year's safety targets will be higher than the targets that were adopted by the TPB last year.

Overview of Member States' Target Setting Methodologies

Maryland: In previous years Maryland set quantifiable and data driven highway safety targets that supported their Toward Zero Deaths (TZD) approach by developing interim targets to reduce overall fatalities and serious injuries by at least 50 percent by 2030.

This year Maryland has adopted a new methodology to set highway safety targets. Unlike the TZD approach, annual targets this year were set using a two-pronged approach. Targets that are experiencing a decreasing trend over time are set using five-year rolling averages and an exponential trend line without a fixed endpoint to calculate future targets. For those targets experiencing increasing trends, however, projections are based on a 2% decrease from the 2016-2020 five-year average, continuing with a 2% decrease for each successive five-year average.

Maryland officials provided TPB staff with trend lines and interim targets for each of the five performance measures based on the safety data for the Suburban Maryland portion of the NCR.

Virginia: The method used by Virginia to set this year's targets is based on a model that forecasts future fatalities and serious injuries based on a broad range of factors. VDOT then estimates the collective impact of their planned and programmed countermeasures and reduces the model forecast by the projected impacts of their engineering and behavioral efforts. This process is only viable at a statewide level and cannot be used effectively to determine targets for smaller regions within the state. To assist their MPOs, VDOT advises MPOs to apply linear regression techniques to make projections for each of the numeric performance measures[2] to calculate the 2018-2022 regional targets. For the rate performance measures[3], VDOT advises MPOs to divide the annual forecasts for fatalities and serious injuries by projected VMT (vehicle miles traveled) to make 2021 and 2022 projections which were then used to calculate the 2018-2022 regional targets.

District of Columbia: The District of Columbia analyzed their safety data using a combination of annual and 5-year average data and polynomial trend lines to determine their targets. TPB staff directly incorporated the District of Columbia targets, as published in their HSIP Annual Report, into the NCR target setting methodology.

Calculation of the National Capital Region Highway Safety Targets

Numerical Targets

The NCR targets for the number of fatalities, number of serious injuries, and number of nonmotorist fatalities and serious injuries were calculated by summing the sub-targets for the Suburban Maryland, Northern Virginia, and District of Columbia portions of the region. This is straightforward mathematical addition.

As a final step, the calculated numerical targets were compared to the corresponding targets adopted by the TPB last year and the lower (more aggressive) target for each performance measure was selected.

[2] Number of fatalities, number of serious injuries, and number of nonmotorist fatalities plus serious injuries

[3] Fatality rate per 100 million VMT and serious injury rate per 100 million VMT

Rate Targets

Determination of rate targets (fatality rate and serious injury rate) are somewhat more complicated and involve mathematically combining the effects of the Suburban Maryland, Northern Virginia, and District of Columbia targets according to their respective proportions of total regional VMT. The following steps illustrate the process for the fatality rate (a similar process was used for the serious injury rate):

1) Determine the percent fatality rate reduction represented by each sub target.

Fatalities per 100 MVMT	2016-2020 Average	2018-2022 Average (sub target)	Percent change
Suburban MD	0.884	0.735	-16.84%
NOVA	0.475	0.430	-9.34%
DC	0.839	1.070	27.52%

2) Determine the proportion of total regional VMT attributable to Suburban Maryland, Northern Virginia, and DC.

Sub region	100 MVMT (2020)	Proportion
Suburban MD	183.79	50.14%
NOVA	152.45	41.59%
DC	30.28	8.26%
Sum	**366.51**	**100.00%**

3) Determine the percent change for the regional rate by multiplying the percent change (from step 1) by the VMT proportion (from step 2).

Sub region	A: Percent change in fatality rate (from step 1)	B: Proportion (from step 2)	A x B
Suburban MD	-16.84%	50.14%	-8.444%
NOVA	-9.34%	41.59%	-3.885%
DC	27.52%	8.26%	2.273%
Sum			**-10.056%**

4) Apply the percent change for the regional rate calculate in step 3 to the 2015-2019 average fatality rate. This is the regional fatality rate target for 2017-2021.

Fatalities per 100 MVMT	2016-2020 Average	Regional percent change (from step 3)	2018-2022 Average (regional target)
NCR	0.704	-10.056%	**0.633**

As a final step, the calculated rate targets were compared to the corresponding targets adopted by the TPB last year and the lower (more aggressive) target for each performance measure was selected. **Since the fatality rate target of 0.588 set last year is lower than the 0.633 figure calculated by mathematically combining the three sub-regional targets, the staff-recommended target is 0.588 (and not 0.633).**

REGIONAL SAFETY TARGETS

Table 4 displays the proposed 2018-2022 National Capital Region Highway Safety Targets.

Table 4: Summary of Highway Safety Targets

Performance Measure (5-year rolling average)	2016-2020 Target	2017-2021 Target	2018-2022 Target	Difference	Percent Difference
# of Fatalities	253.0	253.0	253.0	0.0	0.0%
Fatality Rate (per 100 MVMT)	0.588	0.588	0.588	0.0	0.0%
# of Serious Injuries	2,692.1	2,435.8	1,889.7	-546.1	-22.4%
Serious Injury Rate (per 100 MVMT)	6.110	5.539	3.867	-1.672	-30.2%
# Nonmotorist Fatalities & Serious Injuries	508.6	508.6	508.6	0.0	0.0%

DURATION

Upon adoption by the Transportation Planning Board, the targets described in this report become the official National Capital Region highway safety targets for calendar year 2022.

As per federal regulations, the National Capital Region highway safety targets will be updated on an annual basis by no later than February 28 of each calendar year.

PBPP: DRAFT 2018-2022 ROADWAY SAFETY TARGETS

Jon Schermann
TPB Transportation Planner

Transportation Planning Board
December 15, 2021

Agenda Item 10

National Capital Region
Transportation Planning Board

Presentation Items

- Part I: Review of Safety Trends
- Part II: Progress Towards the 2016-2020 Safety Targets
- Part III: Staff Recommended 2018-2022 Regional Safety Targets
- Part IV: Next Steps

Part I

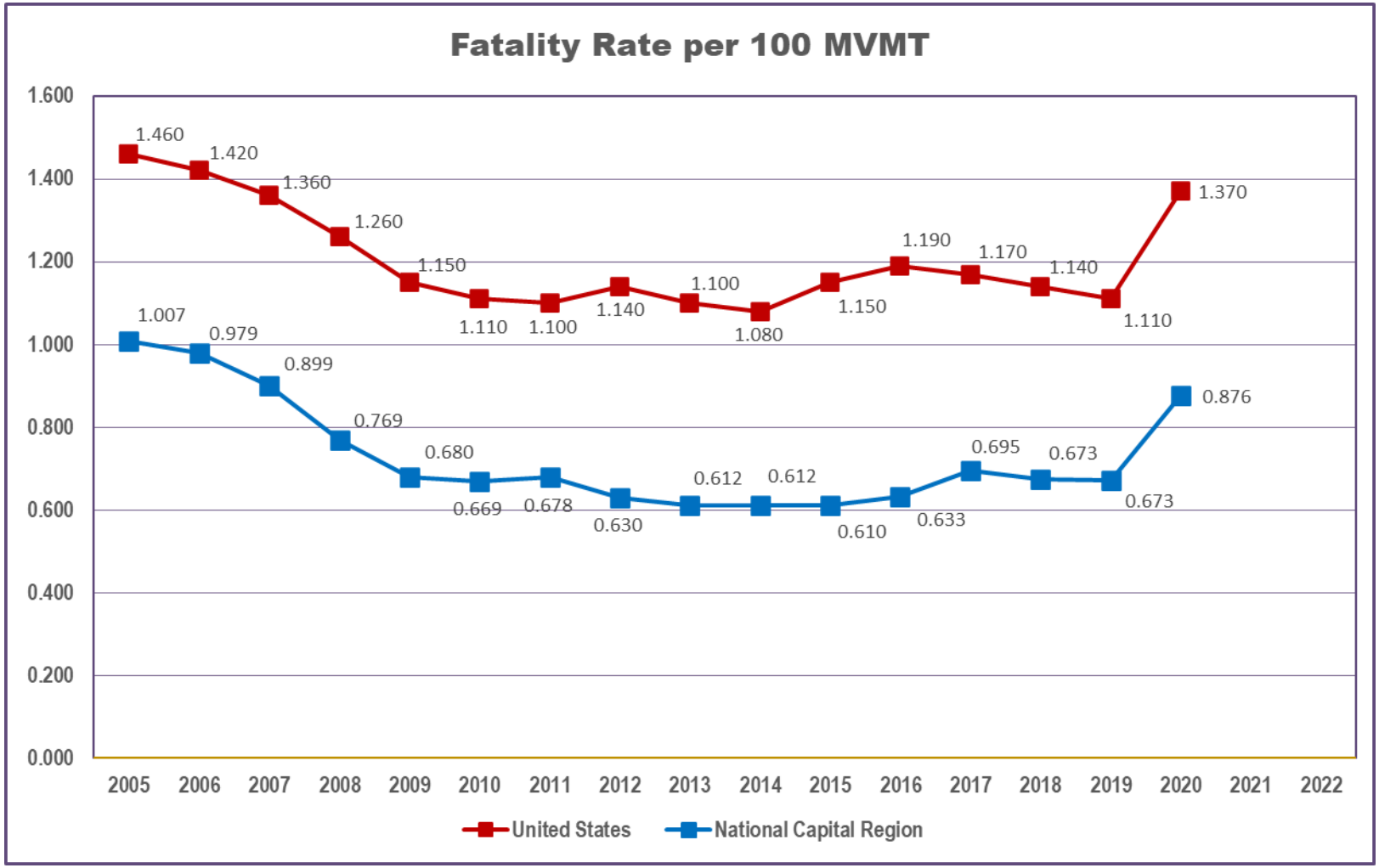
Review of Safety Trends

NCR Safety – With Draft 2020 *Annual* Data

	2016	2017	2018	2019	2020	Change from 2019 to 2020
# of Fatalities	279	313	303	306	321[1]	↑ 4.9 %
Fatality Rate (per 100 MVMT)	0.633	0.695	0.673	0.673	0.876[1]	↑ 30.2 %
# of Serious Injuries	2,916	2,592	2,464	2,371	1,842	↓ 22.3 %
Serious Injury Rate (per 100 MVMT)	6.614	5.755	5.473	5.211	5.026	↓ 3.6 %
# Nonmotorist Fatalities & Serious Injuries	553	580	551	595	440	↓ 26.1 %

Note [1]: Figures listed are from state fatality data; official 2020 federal data not yet published

Fatality Rates: USA and National Capital Region



Part II

Progress Towards the 2016-2020 Roadway Safety Targets

Highway Safety Performance Measures

Performance Measure	Description	Data Source
Number of Fatalities *(5 year rolling average)*	Total number of fatalities during a calendar year	FARS[1]
Rate of Fatalities per 100 million VMT *(5 year rolling average)*	Ratio of total fatalities to VMT	FARS and HPMS[2] (or MPO estimate)
Number of Serious Injuries *(5 year rolling average)*	Total number of serious injuries during a calendar year	State reported serious injury data
Rate of Serious Injuries per 100 million VMT *(5 year rolling average)*	Ratio of total serious injuries to VMT	State reported serious injury data and HPMS
Number of Non-Motorized Fatalities and Serious Injuries *(5 year rolling average)*	Total number of fatalities and serious injuries during a calendar year	FARS and State serious injury data

[1] FARS: Fatality Analysis Reporting System
[2] HPMS: Highway Performance Monitoring System

2015-2019 Actual vs. Targets - NCR

Performance Measure (5-year rolling average)	2016-2020 Actual	2016-2020 Target	Status
# of Fatalities	304.4[1]	253.0	Not met
Fatality Rate (per 100 MVMT)	0.704[1]	0.588	Not met
# of Serious Injuries	2,437.0	2,692.1	Met
Serious Injury Rate (per 100 MVMT)	5.616	6.157	Met
# Nonmotorist Fatalities & Serious Injuries	555.5	508.6	Not met

Note [1]: Figures listed are a combination of FARS and state fatality data; 2020 FARS data not yet published

Part III

Staff Recommended 2018-2022 Roadway Safety Targets

Background (or Why, What, and How)

- The TPB has also set regional targets in January 2018, January 2019, December 2019, and December 2020 – and are scheduled to set their next round of targets in January 2022
  - Federal requirement for State DOTs and MPOs to develop roadway safety targets on an annual basis
  - State DOTs approved their most recent set of targets in August 2021
- Data-driven and realistic highway safety targets are to be set for 5 performance measures
- These data-driven performance measures enable us to consistently track regional safety results
- Targets are averages for a given 5-year period (ex., 2017-2021, 2018-2022 etc.)

2018-2022 Target Setting Methodology

- Apply Maryland's approach to identify a "sub-target" for the Maryland portion of the NCR
- Apply Virginia's suggested approach for its MPOs to identify a sub-target for the Virginia portion of the NCR
- Incorporate the District of Columbia's target as a sub-target for the DC portion of the NCR
- Combine the three sub-targets into a regional target for the NCR
- If a calculated target is higher than the previous target, set the target equal to the previous target

- ***Note that this is the same methodology as was used for last year's (2017-2021) targets***

Summary: NCR Highway Safety Targets: *pre-cap*

	2017-2021 Target	2018-2022 Target	Difference	Percent Difference
# of Fatalities	269.5	271.0	1.5	0.6%
Fatality Rate (per 100 MVMT)	0.628	0.633	0.005	0.8%
# of Serious Injuries	2,435.8	1,889.7	-546.1	-22.4%
Serious Injury Rate (per 100 MVMT)	5.539	3.867	-1.672	-30.2%
# Nonmotorist Fatalities & Serious Injuries	529.9	492.4	-37.5	-7.1%

Summary: NCR Highway Safety Targets: with cap

	2017-2021 Target	2018-2022 Target	Difference	Percent Difference
# of Fatalities	253.0	253.0	0.0	0.0%
Fatality Rate (per 100 MVMT)	0.588	0.588	0.000	0.0%
# of Serious Injuries	2,435.8	1,889.7	-546.1	-22.4%
Serious Injury Rate (per 100 MVMT)	5.539	3.867	-1.672	-30.2%
# Nonmotorist Fatalities & Serious Injuries	508.6	508.6	0.000	0.0%

Summary: NCR Highway Safety Targets

Performance Measure (5-year rolling average)	2016-2020 Target	2017-2021 Target	2018-2022 Target	Difference	Percent Difference
# of Fatalities	253.0	253.0	253.0	0.0	0.0%
Fatality Rate (per 100 MVMT)	0.588	0.588	0.588	0.0	0.0%
# of Serious Injuries	2,692.1	2,435.8	1,889.7	-546.1	-22.4%
Serious Injury Rate (per 100 MVMT)	6.110	5.539	3.867	-1.672	-30.2%
# Nonmotorist Fatalities & Serious Injuries	508.6	508.6	508.6	0.0	0.0%

Part IV

Next Steps

Next Steps

- Finalize roadway safety targets based on board feedback
- Request board approval of targets at the January TPB meeting

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ITEM 11 – Information
December 15, 2021

Draft Results of the TPB Climate Change Mitigation Study

Background:

The TPB Climate Change Mitigation Study of 2021 (CCMS) is a scenario study whose goal is to identify potential pathways for the region to reduce on-road, transportation-sector greenhouse gas emissions to meet COG's regional greenhouse gas (GHG) reduction goals associated with 2030 and 2050. The analysis phase of the study is now complete and includes three "top-down" scenarios and 10 "bottom-up" scenarios that explore single and combination pathways to reduce on-road, transportation-sector greenhouse gas emissions. The board received a detailed briefing on the results of the analysis during a special TPB work session, held Monday, December 13 at 3 PM. Today, the board will receive an abbreviated recap of results from the analysis.




TPB Climate Change Mitigation Study of 2021

Scenario Analysis Findings

DRAFT Report

December 9, 2021

Prepared by

ICF

with support from
Fehr & Peers and
Gallop Corporation

Prepared for

National Capital Region
Transportation Planning Board

Executive Summary

Introduction and Purpose

The Metropolitan Washington Council of Governments (COG) set ambitious goals for reducing regional greenhouse gas (GHG) emissions across all sectors[1] to 50% below the 2005 level by 2030 and 80% below the 2005 level by 2050. While these are non-sector-specific regional goals, it is recognized that transportation contributes a large share of regional GHG emissions, with on-road mobile sources contributing about 34% of total regional GHG emissions in 2018, the year of the latest regional inventory. Consequently, the National Capital Region Transportation Planning Board (TPB), which is the metropolitan planning organization (MPO) for the metropolitan Washington region, is seeking ways to achieve significant reductions of on-road transportation related GHG emissions, commensurate with the overall regional goals for GHG reduction.

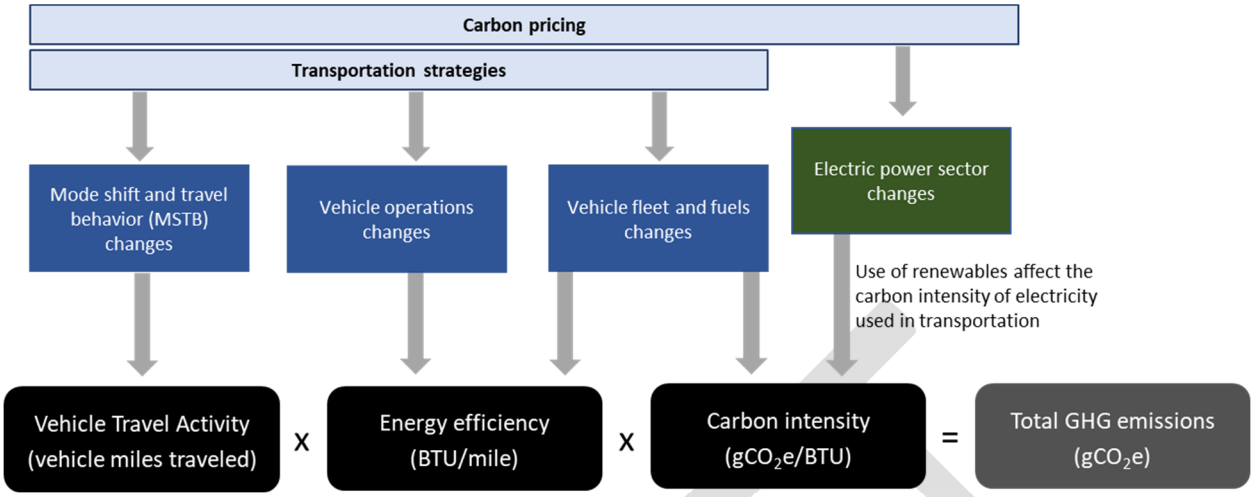
The purpose of this study is to help answer the question, "What would it take to reduce on-road transportation sector GHG emissions by 50% by 2030 and by 80% by 2050, compared to the 2005 level?" This study addressed this question through a scenario analysis that involved exploring the estimated GHG impacts of different on-road transportation strategies and combinations of strategies. The study found that none of the simulated scenarios would meet the 2030 goal of reducing GHG emissions to 50% below the 2005 level for on-road transportation sources. The 2050 goal of reducing GHG emissions to 80% below the 2005 level could only be achieved in one scenario with the most aggressive combination of strategies under a reference electricity grid assumption (which accounts for implementation of existing "on the books" policies related to renewable fuels in the power sector). When assuming cleaner electricity grid emissions profiles, however, more scenarios can meet the 2050 goal, as long as they incorporate substantial shifts to electric vehicles (EVs).

Figure ES-1 illustrates the ways in which transportation strategies affect on-road transportation GHG emissions. In this study, on-road transportation GHG emissions are defined as tailpipe emissions coming directly from combustion of fossil fuels in motor vehicles (called "on-road mobile sources" in most GHG inventories), plus GHG emissions from electricity associated with EVs. Note that while this study explored vehicle technology shifts to EVs charged through plugging into the electric grid, there are other forms of zero emission vehicles (ZEVs) (when considering only tailpipe emissions), such as hydrogen fuel cell electric vehicles.[2]

[1] This includes residential and commercial buildings, transportation and mobile emissions, wastewater treatment, agriculture, and solid waste treatment sectors.

[2] For simplicity, this study focused on EVs using the electric grid. Note that this analysis does not account for full fuel-cycle emissions, which would include the upstream emissions associated with the extraction, transport, and distribution of fuels used in transportation, and does not account for other emissions associated with transportation infrastructure development and maintenance, nor production of vehicles. It also does not account for emissions associated with non-road transportation sources, such as rail (e.g., Metrorail, commuter rail, freight rail) or aviation.

Figure ES-1. Strategies and Pathways for Reducing GHG Emissions from Transportation



As shown in Figure ES-1, on-road transportation GHG emissions are a function of vehicle travel, the energy efficiency of vehicles, and the carbon intensity of fuels used. The scenarios explored in this analysis included a broad array of strategies under **three primary pathways** for reducing GHGs from on-road transportation sources:

1) **Vehicle Technologies and Fuels:** Strategies to shift the fleet of motor vehicles to electric vehicles (EVs) and increase the share of lower carbon fuels (e.g., biofuels).

2) **Mode Shift and Travel Behavior (MSTB):** Strategies to reduce motor vehicle travel, typically measured as vehicle miles of travel (VMT), by shifting travel from driving alone to more efficient modes, such as transit, ridesharing, bicycling, and walking; reducing vehicle trip lengths, such as through land use strategies; or reducing trip-making entirely, such as through telework. These strategies primarily affect passenger travel, rather than freight.

3) **Transportation Systems Management and Operations (TSMO):** Strategies to optimize the efficiency of travel by reducing vehicle travel delay and/or encourage more eco-friendly driving patterns.

The use of renewable fuels in the electric power grid influences how much GHGs are emitted from EVs, and this study explored three different possible cases for future electric power GHG emissions factors, recognizing the movement toward a decarbonized power sector:

1. A Reference Case, which incorporates all "on-the-books" policies, including renewable portfolio standards (RPSs) in the District of Columbia, Maryland, and Virginia.
2. A Modified Reference Case, which is slightly more aggressive than the Reference Case, resulting in a near zero carbon grid by 2040.
3. A Clean Grid Case, assuming a 100% carbon free grid by 2035.

As transportation power sources move toward electricity, utility electricity grid emissions become increasingly important in decarbonization of the sector.

Carbon pricing – in the form of a fee on carbon emissions or market-based mechanisms such as cap-and-trade or cap-and-invest programs – has been identified as a potentially promising overarching strategy, but this study

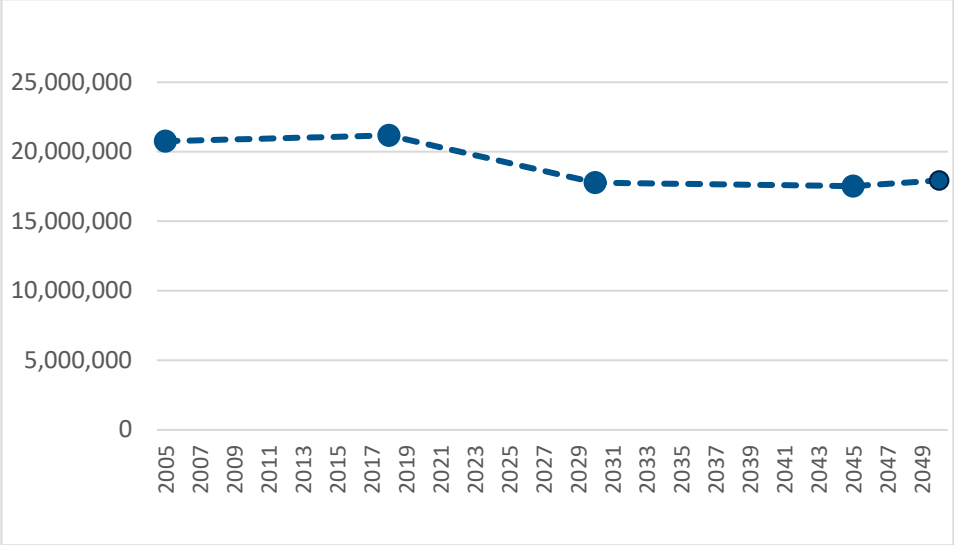
did not explicitly analyze carbon pricing. However, carbon pricing may be a mechanism that would help to support other strategies analyzed under this study, such as shifts toward EVs and less-carbon intensive modes of travel.

Study Baseline Forecast

The baseline scenario for this study is based on the VMT and tailpipe GHG emissions projections consistent with TPB's Visualize 2045 Long-Range Transportation Plan and COG's 2030 Climate and Energy Action Plan (2030 CEAP). To calculate 2050 VMT and emissions, the 2045 passenger VMT projections were extrapolated to 2050 using estimated population growth rates and forecast reductions in VMT per capita estimated for the period 2030 to 2045 extended to 2050. VMT from light-duty commercial trucks, heavy-duty trucks, and combination trucks was assumed to continue increasing at the same annual rate as the period between 2030 and 2045. A total increase in VMT between 2045 and 2050 of 2.5% was calculated across all vehicle types.

The GHG emissions estimates developed for the performance analysis of past TPB's long-range transportation plans, including Visualize 2045, include only tailpipe emissions, while this study also accounts for the emissions generated to charge EVs. The baseline estimates shown in Figure ES-2 are a sum of the tailpipe emissions plus electricity emissions, calculated based on the National Renewable Energy Lab (NREL) reference case penetration of EVs.[3]

Figure ES-2. Baseline On-Road GHG Emissions ($MTCO_2e$)



It is important to note that the baseline GHG emissions totals show lower total emissions in 2030 and 2050 compared to 2005, approximately 14% lower in both cases. This is because the projected improvements in fuel economy, leading to decreased emissions, offset increases in VMT. Note that these reductions in on-road

[3] NREL. (2018). Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States

transportation GHG emissions are estimated to occur over a time when population in the region is projected to increase about 25% (to 6.25 million) by 2030 and about 43% by 2050 (to 7.15 million) compared to the 2005 level (4.99 million).

Scenario Approach

The study involved **two different types of analysis**:

1) Three "top-down" scenarios were developed and analyzed to identify what level of vehicle miles traveled (VMT) would need to be reduced, or what level of EV adoption would be needed, to meet the 50% and 80% reduction goals by 2030 and 2050, respectively; and
2) Ten "bottom-up" scenarios were developed to assess how much GHG reduction might be expected with implementation of different sets of strategies in order to determine which scenarios could meet the 2030 and 2050 GHG reduction goals.

The **"top-down" analysis** explored three key questions: 1) What level of VMT reduction would be needed to meet the regional 2030 and 2050 goals if VMT reduction were the sole focus of efforts? 2) What level of electric vehicle (EV) adoption would be needed to meet the regional 2030 and 2050 goals if vehicle technology were the sole focus of efforts? 3) What level of VMT reduction would be needed to meet the regional 2030 goal assuming vehicle technology assumptions in COG's 2030 Climate and Energy Action Plan (2030 CEAP)?[4]

The **"bottom-up" analysis** involved development and analysis of ten scenarios: six focused on individual pathways (e.g., vehicle technologies and fuels alone, MSTB alone, or TSMO alone), and four involving combinations of the other scenarios. Table ES-1 lists all ten scenarios that were explored. Each scenario was defined to incorporate an aggressive set of strategies or assumptions about changes in the vehicle fleet, fuels, or travel behavior (e.g., levels of telework) corresponding with aggressive strategy implementation. While each scenario was defined to be potentially feasible, they were generally designed with high-end assumptions (both in the base scenarios and amplified scenarios), without regard to political feasibility, and some with very optimistic assumptions about shifts in technology.

[4] "Metropolitan Washington 2030 Climate and Energy Action Plan" (Washington, D.C.: Metropolitan Washington Council of Governments, November 18, 2020), https://www.mwcog.org/documents/2020/11/18/metropolitan-washington-2030-climate-and-energy-action-plan/.

Table ES-1. Ten Scenarios Studied in "Bottom-Up" Analysis

Pathway	Scenario	Key Components / Assumptions
Vehicle Technology (VT) and Fuels	VT.1: Vehicle Technology and Fuels Improvement Scenario	Shifts to EVs (50% of new light-duty [LD] vehicle sales are EVs in 2030, with 100% by 2040; 30% of new medium/heavy-duty [M/HD] truck sales are EVs in 2030, with 100% by 2050; 50% of buses on the road are EVs in 2030, 100% in 2050; biodiesel/renewable diesel makes up 10% of diesel fuel use in 2030 and 20% in 2050)
	VT.2: Amplified Vehicle Technology and Fuels Improvement Scenario	More aggressive shifts to EVs: 100% of new LD vehicle sales are EVs in 2030; 50% of new M/HD truck sales are EVs in 2030, with 100% by 2040; 100% of buses on the road are EVs by 2030; biodiesel/renewable diesel makes up 20% of diesel fuel use in 2030 and 30% in 2050
Mode Shift and Travel Behavior (MSBT)	MS.1: Mode Shift Scenario	Land use changes focused on redistribution of future growth to activity centers and areas better served by transit across jurisdictions and 77,000 new households in the region by 2030 and 126,000 new households in the region by 2050 to support jobs-housing balance; enhanced bike/pedestrian/micromobility environment; transit fares reduced 50% by 2030 and 75% in 2050; all workplace parking in activity centers priced by 2030; transit enhancements (10% reduction in transit travel time by 2030 and 20% by 2050); 25% telework
	MS.2: Mode Shift Scenario + Road Pricing	Same strategies as MS.1, plus DC cordon pricing of $10 to enter downtown, and VMT-fees of $0.05 per mile in 2030 and $0.10 per mile in 2050
	MS.3: Amplified Mode Shift Scenario + Road Pricing	MS.2 with amplified strategies, including free transit; all workplace parking priced by 2050 (not just in activity centers), further transit enhancements (15% reduction in transit travel time by 2030 and 30% by 2050); 40% telework[5]
Transportation Systems Management & Operations (TSMO)	TSMO: Operations Improvement Scenario	Optimized operations through intelligent transportation systems (ITS) including ramp metering, incident management, active signal control, and active transportation demand management; assumed operational benefits from connected/automated vehicles (CAVs) in 2050
Combined Pathways	COMBO.1: Combined Scenario	VT.1 + MS.1 + TSMO
	COMBO.2: Combined Scenario with More Aggressive Technology Emphasis	VT.2 + MS.1 + TSMO
	COMBO.3: Combined Scenario with More Aggressive Mode Shift Emphasis	VT.1 + MS.3 + TSMO
	COMBO.4: Combined Scenario with Aggressive Actions Across All Pathways and Shared CAV Future	VT.2 + MS.3 + TSMO + shared CAV assumptions

[5] Since only 50% of jobs in the metropolitan Washington region are telework capable, 40% telework implies that 80% of employees who work in telework-capable jobs would be teleworking on a typical workday, which is a very aggressive assumption.

Scenario Analysis Results

Top-Down Analysis: What would it take to reach the GHG reduction goals solely through VMT reduction or EV adoption?

The "top down" analysis of what it would take to reach the 2030 or 2050 goals highlights how challenging it would be to reach the goals within the on-road transportation sector, particularly for 2030, through either VMT reduction alone or shifts to EVs alone. The analysis also highlights the challenge of meeting the 2030 goal even with vehicle technology assumptions in the 2030 CEAP. To meet the 50% emissions reduction goal by 2030 through VMT reduction alone, passenger VMT would need to drop by an estimated 57% from the 2018 level. This is an unprecedented level of VMT reduction that would mean traffic volumes in the region would need to shrink to the level seen at the height of the COVID-19 stay-at-home orders during April 2020 and not rebound, despite a forecasted 12% increase in regional population between 2018 and 2030.

Similarly, meeting the 2030 goal is extremely ambitious with vehicle technology improvements alone. To achieve the 50% emissions reduction goal by 2030 using vehicle technology alone, approximately 75% of vehicles on the road would need to be EVs by 2030 using "reference grid case" electric power assumptions (which assumes increases in use of renewable fuels consistent with existing policies) and about 48% would need to be EVs assuming a "clean grid case." These levels appear extremely difficult, given the length of time people generally hold onto vehicles,[6] and would likely require immediate shifts to all new vehicles sold as EVs combined with aggressive incentives to accelerate vehicle turnover and/or carbon or fuel pricing. The small number of years between today and 2030 means there is very limited time to achieve the large shifts in fleet technology that would be required to meet the goal for 2030.

Looking at combining technology enhancements with VMT reduction still provides an intense challenge for meeting the 2030 goal within the on-road transportation sector. Even with the 2030 CEAP technology assumptions[7], passenger VMT would need to drop by about 49% from the 2018 level, which is an unprecedented level of VMT reduction over a sustained time and would likely require that vehicles be subject to high levels of pricing (road, parking, and/or fuel), nearly complete telework, and restrictions on driving. There simply is too little time for the vehicle fleet to turn-over with enough EVs to allow for a more moderate level of reduction in VMT, particularly given that medium- and heavy-duty commercial vehicles made up about one-quarter of on-road transportation GHG emissions in 2018, and that there is limited potential to reduce VMT by commercial/freight vehicles, due to the necessity of freight and goods movement, combined with relatively limited opportunities to shift these vehicles to EVs on a broad scale in the near-term.

[6] See, for example, Brad Plumer, Nadja Popovich, and Blacki Migliozzi, "Electric Cars Are Coming. How Long Until They Rule the Road?," *The New York Times*, March 10, 2021, sec. Climate, https://www.nytimes.com/interactive/2021/03/10/climate/electric-vehicle-fleet-turnover.html.

[7] The 2030 CEAP assumed that in 2030, 34% of light duty passenger car VMT, 17% of light duty passenger truck VMT, 34% of transit bus VMT, 7% of medium duty truck VMT, and 6% of heavy duty truck VMT would be driven by EVs.

Challenges remain for meeting the 2050 goal. Based on the ICF analysis, it would not be possible to attain the 80% reduction goal through passenger VMT reduction alone since estimated medium- and heavy-duty vehicle emissions exceed the goal level in 2050. Similarly, the 2050 goal cannot be achieved even if all vehicles were converted to EVs under "reference case" assumptions for electricity carbon intensity. However, the goal could be met with a completely carbon-free electric grid if about 79% of vehicles on the road were EVs in 2050. These findings highlight the importance of large-scale shifts to EVs (zero emissions from the tailpipe) combined with a clean electric power grid in order to decarbonize the on-road transportation sector.

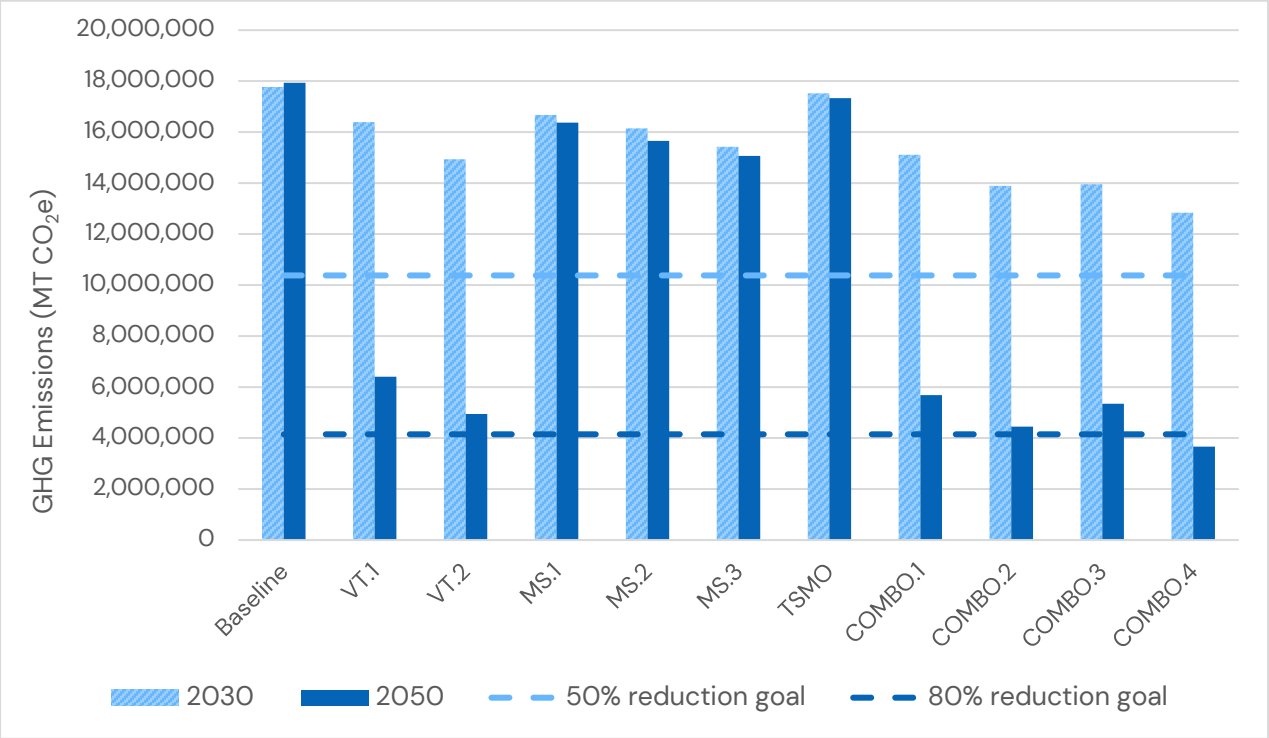
Bottom-Up Analysis: Which scenarios achieve the goals?

In short, none of the simulated scenarios meet the 2030 goal of reducing GHG emissions to 50% below 2005 levels, and only one scenario provides enough emissions reductions to meet the 2050 goal of 80% below 2005 levels under the "reference case" electric grid. When conducting the analysis with cleaner electricity grid emissions profiles, more scenarios are able to meet the 2050 goal of 80% below 2005 levels; however, still no scenarios were able to meet the 2030 goal of 50% below 2005 levels. This finding is consistent with results of the "top-down" analysis, which showed the challenge of meeting the 2030 goal within the on-road transportation sector.

The results of the "bottom up" scenario analysis conducted under the "reference grid" case are shown in Figure ES-3. As expected, the scenarios that combine multiple types of strategies (COMBO scenarios) are more effective than those that simply focus on individual strategies. The on-road transportation GHG emission reductions across all scenarios range from 16% (TSMO) to 38% (COMBO.4) in 2030 (note that, in the baseline forecast for this study, on-road transportation GHG emissions are estimated to be 14% below the 2005 level in 2030). It should be noted, however, that the 50% reduction goal is a multisector goal for the region, with expected contributions from residential and commercial buildings, waste, aviation, and other sectors. Several of the combination scenarios provide estimated on-road GHG emission reductions at levels assumed in COG's multisector 2030 CEAP, suggesting that the multisector goal could potentially be met with these levels of on-road transportation GHG reductions if other sectors also implement aggressive strategies.

In 2050, only the most aggressive scenario with a combination of the most aggressive strategies across each pathway – COMBO.4 – provides enough emission reductions to reach the 80% reduction goal, assuming the reference grid case. Among the individual scenarios, the amplified vehicle technology and fuels improvement scenario – VT.2 – gets the closest to the 2050 goals by providing a 76% GHG emission reduction, demonstrating the importance of vehicle technology improvements. Under the VT.2 scenario, by 2050, nearly all light-duty vehicles are estimated to be EVs, and over three-quarters of all medium- and heavy-duty vehicles are EVs, resulting in a dramatic (approximately 93%) reduction in on-road tailpipe and evaporative emissions. While the reference grid case assumes a substantial increase in renewable electricity consistent with existing "on-the-books" standards, the offsetting electricity-related emissions mean that even this level of conversion to EVs is not enough to meet the goal. While the emissions benefit for every VMT reduced is much lower in 2050 than today, the most aggressive scenario for VMT reduction is also needed in combination with the technology improvements to meet the goal.

Figure ES-3. On-Road Transportation GHG Emissions Estimated for the Reference Grid Case



The Reference Grid Case is based on current "on-the-books" power sector policies in the District of Columbia, Maryland, and Virginia, and represents a reduction in carbon intensity compared to the current electric power grid.

Table ES-2 shows the full result of the analysis of each of the ten bottom-up scenarios (and the baseline scenario) performed under the different electric grid scenarios. In the case of a clean electric grid, which assumes 100% carbon free grid by 2035, the GHG emissions from the vehicle technology and fuels improvement scenarios are reduced further since there are no off-setting electricity emissions from EVs. Under these assumptions, both the VT scenarios meet the 80% reduction goal. Under the clean grid assumption, MSTB strategies have limited additional effects since most passenger vehicles are assumed to be 100% clean and TSMO enhancements generate small additional benefits for the remaining largely medium- and heavy-duty vehicles that are not EVs. Table cells with values that meet the GHG reduction goals are shaded light green.

Table ES-2. Summary of GHG Reductions Estimated for All Transportation Scenarios Under all Electric Grid Cases (% Reductions from 2005 Level)

Scenario	Key Components	2030			2050		
		Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline	Projects, programs, and plans in the Visualize 2045 plan; base assumptions for vehicle technology; population growth through 2050	-14%	-15%	-15%	-14%	-14%	-15%
VT.1	50% of new LD vehicle sales are EVs in 2030, with 100% by 2040; 30% of new M/HD truck sales are EVs in 2030, with 100% by 2050; 50% of buses on the road are EVs in 2030, 100% in 2050; biofuels/renewable diesel make up 10% of diesel fuel use in 2030 and 20% in 2050	-21%	-21%	-24%	-69%	-75%	-84%
VT.2	100% of new LD vehicle sales are EVs in 2030; 50% of new M/HD truck sales are EVs in 2030, with 100% by 2040; 100% of buses on the road are EVs by 2030; biofuels/renewable diesel make up 20% of diesel fuel use in 2030 and 30% in 2050	-28%	-29%	-34%	-76%	-83%	-93%
MS.1	Land use changes, including new housing in the region; transit fares reduced 50% by 2030 and 75% in 2050; all workplace parking in activity centers priced by 2030; 10% reduction in transit travel time by 2030 and 20% by 2050; 25% telework; increased bike/ped/mobility	-20%	-20%	-20%	-21%	-21%	-22%
MS.2	MS.1 + DC core cordon pricing + VMT-fees of $0.05 per mile in 2030 and $0.10 per mile in 2050	-22%	-22%	-23%	-25%	-25%	-25%
MS.3	MS.2 with amplified strategies, including free transit; all workplace parking priced by 2050 (not just in activity centers), 15% reduction in transit travel time by 2030 and 30% by 2050; 40% telework	-26%	-26%	-26%	-27%	-28%	-28%
TSMO	Optimized ITS/TSMO, with benefits from connected/automated vehicles (CAVs) by 2050	-16%	-16%	-17%	-16%	-17%	-18%
COMBO.1	Combined scenario: VT.1+ MS.1 + TSMO	-27%	-28%	-30%	-73%	-78%	-86%
COMBO.2	Combined scenario with more aggressive technology emphasis: VT.2 + MS.1 + TSMO	-33%	-34%	-38%	-79%	-85%	-94%
COMBO.3	Combined scenario with more aggressive mode shift emphasis: VT.1 + MS.3 + TSMO	-33%	-33%	-36%	-74%	-79%	-87%
COMBO.4	Combined scenario with aggressive actions across all pathways and shared CAV future: VT.2+MS.3+TSMO+additional sharing	-38%	-39%	-43%	-82%	-87%	-95%

Implications and Policy Considerations

The scenario analysis results emphasize the difficulty of meeting the 2030 goal within the on-road transportation sector. The results, however, suggest that combining vehicle technology, MSTB, and TSMO strategies together results in the largest emissions benefits, and could achieve levels of emissions benefits that are consistent with assumptions in the 2030 CEAP at a level that would be needed to meet the overall regional goal, if other sectors contribute at levels estimated in the 2030 CEAP. The study suggests that both rapid shifts toward lower emissions vehicles/fuels and vehicle travel reduction strategies are needed to achieve the near-term goal. By 2050, shifts to EVs and a clean electric grid are expected to be the most important factors in meeting the 80% reduction goal, and MSTB strategies will be less important in meeting the goals if the vehicle fleet becomes nearly carbon-free. That said, MSTB strategies likely will play a valuable role over the intervening years and would be helpful in case the vehicle fleet does not convert to zero-emissions as quickly; MSTB strategies could also help to reduce the potential that shifting to EVs and/or connected and automated vehicles (CAVs) might encourage more vehicle travel if the cost or burden of driving is decreased.

Many of the transportation strategies explored in the scenarios have co-benefits for the region, including improving air quality, enhancing mobility, and improving the reliability and safety of the transportation system. In particular, many MSTB strategies, including land use efforts to bring jobs and housing closer together, transit enhancements, free or reduced cost transit, and bicycle/pedestrian/micromobility enhancements also offer significant potential to enhance equity by supporting more equitable access to jobs and other opportunities across racial, ethnic, and income levels. At the same time, some potentially effective MSTB strategies such as road pricing may be regressive, unless designed appropriately to consider equity, such as by taking factors such as household income into account and using funds for transit and equity-focused services. Telework is not applicable for workers in many lower-income service industries and may have adverse impacts on businesses with low-income workers, such as restaurants and some services, particularly in downtown areas.

In moving forward, it will be important for the region's policy makers to consider the roles of regional, state, and federal government policy, as well as the private sector. Intergovernmental cooperation and working together with the private sector will likely be critical to achieving the goals, as spurring adoption of EV technology and clean energy is so vital in this process, and land use and telework policies are dependent on decisions by the private sector and employers. Policy makers will need to consider the costs, revenue implications, benefits, and equity implications of policy actions, and consider how transportation investments can best move toward GHG reduction goals while supporting the region's mobility, safety, economic, community, and other environmental goals.

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Transportation Climate Change Mitigation Scenarios Analysis

1 Introduction and Purpose

The Metropolitan Washington Council of Governments (COG) has set ambitious goals for reducing regional greenhouse gas (GHG) emissions to 50% below 2005 levels by 2030 and 80% below 2005 levels by 2050. While these are non-sector-specific regional goals, it is recognized that transportation contributes a large share of regional GHG emissions, with on-road mobile sources contributing about 34% of total regional GHG emissions in 2018, the year of the latest regional inventory.[1] Consequently, the National Capital Region Transportation Planning Board (TPB), which is the metropolitan planning organization (MPO) for the metropolitan Washington region and is one of several policy boards that meets at COG, is interested in studying ways to achieve significant reductions of on-road transportation related emissions, commensurate with the overall regional goals for GHG reduction.

The purpose of this study is to help answer the question, "What would it take to reduce on-road transportation sector GHG emissions commensurate with the region's 50% by 2030 and 80% by 2050 reduction goals?" In addition, TPB members have also expressed interest in exploring goals that go beyond 80% reduction to reflect carbon neutral goals that are being discussed and advanced within the region.[2]

Study Approach

This study involved several components:

1) **A review of previous climate change mitigation studies in the COG region** – Conducted by TPB staff, the Phase I study involved a review of studies by COG and TPB that quantified GHG reductions from regional on-road transportation projects, programs, and policies, including the "What Would it Take?" Scenario

[1] Metropolitan Washington Council of Governments. "Metropolitan Washington 2030 Climate and Energy Action Plan." November 2020. https://www.mwcog.org/documents/2020/11/18/metropolitan-washington-2030-climate-and-energy-action-plan/

[2] For instance, the 2021 Maryland Department of the Environment Greenhouse Gas Emissions Reduction Act (GGRA) committed to a statewide goal of 50% below 2005 levels by 2030 and net zero by 2045; and the District of Columbia has set a goal to reach 50% GHG emission reduction below 2006 levels by 2032, and to be carbon neutral by 2050.

Study, the Multi-Sector Working Group (MSWG) study, and the Long-Range Plan Task Force (LRPTF) study. The Phase I effort, resulting in a report[3] dated March 2, 2021, also discussed the collaborative actions proposed to reduce GHG emissions from the on-road transportation sector that were identified in the Metropolitan Washington 2030 Climate and Energy Action Plan (2030 CEAP) to support the region in achieving its 2030 GHG emission reduction goals.[4]

2) **A literature review of climate change mitigation studies and climate action plans both from within the region and across the world** – The literature review outlined a variety of potential strategies for achieving reductions of on-road transportation GHG emissions. The document reviewed climate change mitigation plans and studies conducted within the metropolitan Washington region, in other areas across the country, and around the world. The literature review also summarized research on transportation GHG strategies and their effectiveness. The literature review[5] findings provided a basis for identifying transportation GHG strategies to include in scenarios and to consider for modeling and analysis.

3) **Analysis of a set of "top-down" scenarios, exploring what would it take for the on-road transportation sector to achieve the regional goals if focusing solely on reducing vehicle travel reduction or vehicle technology adoption** – This analysis was designed to identify what level of vehicle miles traveled (VMT) reduction would be required to meet the goals if mode shift and travel behavior strategies were the sole focus, and what level of electric vehicle (EV) adoption would be needed to meet the goals if technology deployment were the sole focus of efforts. At the request of the TPB Technical Committee, a supplemental, top-down analysis was also conducted to explore what level of VMT reduction would be needed to meet the 50% reduction goal by 2030 using the technology strategy assumptions in the region's 2030 Climate and Energy Action Plan (2030 CEAP).

4) **Analysis of a set of "bottom-up" scenarios, exploring different combinations of strategies to assess their potential to reduce GHG emissions from on-road transportation to meet the 2030 and 2050 regional goals** – This effort involved development of a set of ten (10) scenarios for analysis, defined to include different sets of GHG reduction strategies, building on the information from the literature review on potentially promising strategies being considered as part of climate action planning efforts within the region or in other regions, as well as those identified in the research as potentially promising. The scenarios were defined to address a full array of pathways for GHG reduction from on-road

[3] "TPB Climate Change Mitigation Study of 2021 Phase 1 Report: Greenhouse Gas Emissions Reductions Strategies: Findings from Past Studies." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, March 2, 2021. https://www.mwcog.org/documents/2021/07/15/tpb-climate-change-mitigation-study-of-2021-climate-change-greenhouse-gas-scenario-planning/

[4] The Phase I study, and other associated documents with the Phase II effort are available on the COG website at https://www.mwcog.org/documents/2021/07/15/tpb-climate-change-mitigation-study-of-2021-climate-change-greenhouse-gas-scenario-planning/.

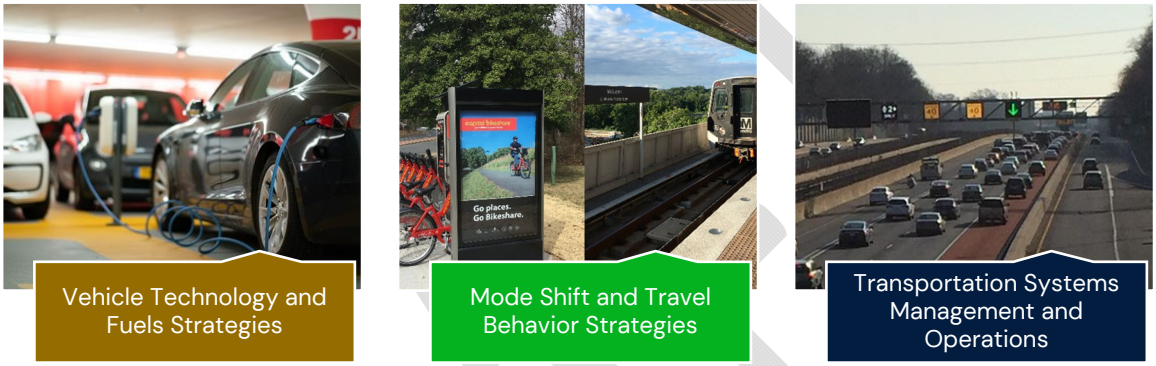
[5] ICF. "TPB Climate Change Mitigation Study of 2021: A Review of Climate Action Plans and Literature on Transportation Greenhouse Gas Emissions Reduction Strategies and their Effectiveness." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, July 8, 2021. https://www.mwcog.org/documents/2021/07/15/tpb-climate-change-mitigation-study-of-2021-climate-change-greenhouse-gas-scenario-planning/

transportation and represent aggressive levels of action, well beyond current plans. These scenarios were then analyzed using a wide array of sketch-planning tools and techniques, along with limited use of the region's travel demand forecasting model, and the results form the bulk of this study report.

Pathways to GHG Reduction from On-Road Transportation

The ICF team addressed the primary study questions through a scenario analysis approach relying on a set of GHG reduction strategies and implementation levels. The strategies covered three primary areas of intervention or pathways to reduce GHG emissions:

Figure 1: GHG Reduction Pathways



- **Vehicle technology (VT) and fuels strategies** seeking to reduce the carbon-intensity of vehicle travel by shifting to EVs (zero emissions from the tailpipe) and lower carbon fuels (emitting less carbon per unit of energy) and increasing the fuel efficiency of vehicles (less energy used per VMT).
- **Mode Shift and Travel Behavior (MSTB) strategies** seeking to shift travel to more efficient modes and reduce VMT, often through improving public transit, active transportation options, travel demand management programs, land use planning, and road pricing or other pricing strategies.
- **Transportation Systems Management and Operations (TSMO) strategies** seeking to reduce vehicle travel delay and/or encourage more fuel-efficient driving patterns, since GHG emissions from conventional vehicles are highest during idling and during stop-and-go congested conditions.

The strategies were analyzed both separately and in combination to provide a more realistic picture of the different solutions available to try achieving the GHG reduction targets by taking action at multiple levels. This document describes in detail the analysis approach and assumptions, illustrates the results of the analysis in terms of GHG reduction for each scenario, and provides implementation considerations inclusive of co-benefits and equity outcomes.

Electric Grid Assumptions

As transportation power sources move toward electricity, utility electricity grid emissions become increasingly important in decarbonization of the sector. This analysis modeled several electricity grid possibilities based on existing and potential state and national polices related to the electricity grid. The model was completed using

ICF's Integrated Planning Model[6], a multi-regional, dynamic, deterministic linear programming model of the U.S. electric power sector developed by ICF. It provides forecasts of least-cost capacity expansion, electricity dispatch, and emission control strategies while meeting energy demand, environmental, transmission, dispatch, and reliability constraints. IPM's grid factor projections include state-specific electricity decarbonization policies. The grid factor projections also weigh in the emission intensity of imports to the states based on each state's imports in 2019 (from EIA data). The electricity emissions factors estimated from IPM for the modeled region were used to calculate emissions associated with EV charging.

Three alternative cases are used for the electricity GHG analysis, reflecting the projected changes in grid-emission intensity over time based on decarbonization policies:

1. **A Reference Case**, which incorporates all "on-the-books" policies, including renewable portfolio standards (RPSs) in the District of Columbia, Maryland, and Virginia. These policies include those defined in Virginia's Clean Economic Act (100% clean power by 2045, assuming Dominion as the dominant utility), Maryland's Renewable Portfolio Standard (50% renewable energy by 2030) and DC's Renewable Portfolio Standard (100% renewable energy by 2032).
2. **A Modified Reference Case**, which is slightly more aggressive than the Reference Case, resulting in a near zero carbon grid by 2040 based on enhanced clean energy policies in Maryland that more closely match those from DC and Virginia.
3. **A Clean Grid Case**, assuming a 100% carbon free grid by 2035.

Table below provides a summary of the estimated GHG emissions factors per unit of electricity use (Megawatt-Hours) under each of the three cases in comparison to 2018.

Table 1. Estimating Electric Power Generation Emissions Factors under Alternative Grid Assumptions (MT CO2e/MWh)

Grid Case	2018	2030	2050
Reference Case	0.337	0.249	0.137
Modified Reference Case	-	0.224	0.082
Clean Grid Case	-	0.050	0.000

It is important to note that the Reference Case assumes considerable reductions in in the carbon intensity of electricity compared to current electric grid conditions, not simply holding emissions rates constant. This case is somewhat similar to the assumptions in COG's Climate and Energy Action Plan's Clean Energy case, by incorporating and counting all "on the books" RPS policies. These values may differ slightly since IPM accounts for imports from out of state and the 2030 CEAP also included two policies which are difficult to account for:

[6] https://www.icf.com/technology/ipm

Distributed generation (> 200,000 additional solar systems, equivalent to 24 percent of single-family homes), and green power purchases (continued 10 percent annual growth).

Baseline Forecast Scenario

What's Included in the Scenario

The baseline scenario includes the most recent COG VMT and emissions projections[7] through 2045. To calculate 2050 VMT and emissions, the 2045 passenger VMT projections were extrapolated to 2050 based on the population growth rate between 2040 and 2045 as reported in the TPB Round 9.1a Cooperative Forecast[8], and assumed continued trends of reduced VMT per capita. VMT from Light-Duty Commercial Trucks, Heavy-Duty Trucks, and Combination Trucks was assumed to continue increasing at the same annual rate as the period between 2030 and 2045. Between 2045 and 2050, this represents a total increase in VMT for these categories of 2.7%, 3.4%, and 3.5%, respectively. Then, the emissions rates of ICE vehicles from 2045 were assumed to be held constant in 2050 to obtain tailpipe emissions for 2050 from extrapolated 2050 VMT. On top of tailpipe emissions, the NREL[9] reference case of EV penetration of VMT was multiplied by the reference electric grid case emission rates and assumed vehicle energy use per mile to obtain electricity emissions from energy required to power EVs. The Baseline estimates are a sum of the tailpipe emissions plus electricity emissions for the reference case penetration of EVs. No EVs were assumed to be in the fleet in 2005. The baseline total emissions are shown in Figure 2 and Table 2.

[7] 2005, 2018 and 2030 VMT and emissions projections are based on the Round 9.1 Cooperative Forecasts, MOVES2014b, and the Regional Travel Demand Model Version 2.3.75. 2045 VMT and emissions projections, developed upon completion of the 2030 CEAP, are based on MOVES2014b, as well as the Round 9.1a Cooperative Forecasts and the Regional Travel Demand Model Version 2.3.78, which do not differ substantially from the assumptions and tools that were used in development of estimates for 2005, 2018, and 2030.

[8] https://www.mwcog.org/documents/2021/12/02/cooperative-forecasts-employment-population-and-household-forecasts-by-transportation-analysis-zone-cooperative-forecast-demographics-housing-population/

[9] NREL. (2018). Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States

Figure 2. Baseline On-Road GHG Emissions (MTCO2e)

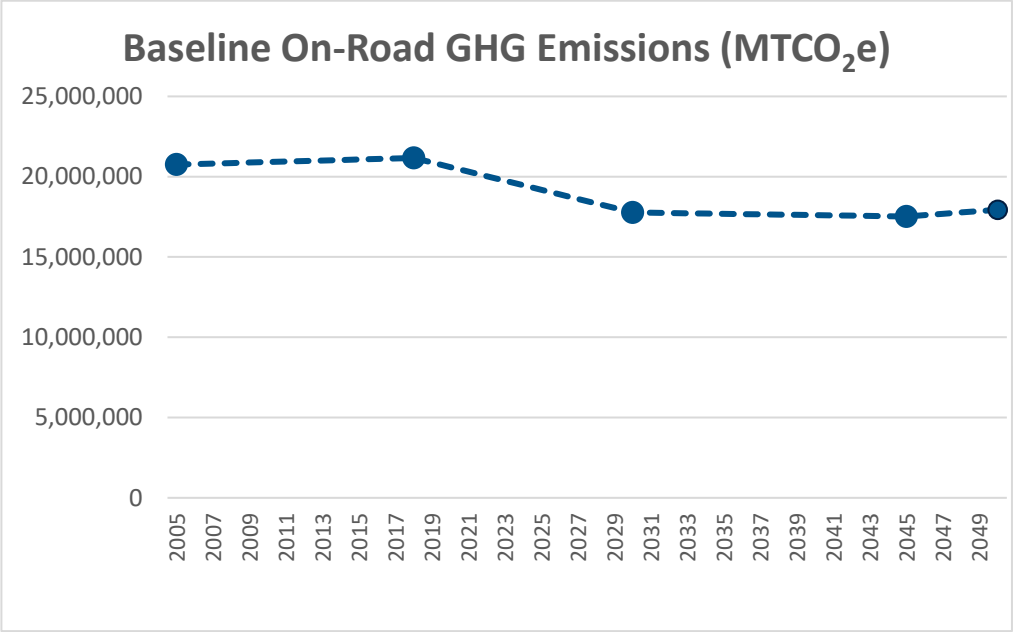


Table 2. Baseline GHG emissions

GHG Emissions (MMT CO2e)	2005	2018	2030	2045	2050
Baseline Emissions (tailpipe)	20.75	21.12	17.53	17.31	17.72
Baseline Emissions (electricity)	0	0.04	0.24	0.21	0.21
Total Baseline Emissions	**20.75**	**21.16**	**17.77**	**17.52**	**17.93**

Note: Electricity usage increases in the baseline forecast but the electricity grid gets cleaner in the reference case forecast.

It is important to note that the baseline emissions totals show lower total emissions in 2030 and 2050 compared to 2018, approximately 14% lower in both cases. This is because projected improvements in fuel economy, leading to decreased emissions, offset increases in VMT. Fuel economy improvements in MOVES 2014[10] reflect standards[11] for cars and light trucks beginning with model year 2017 and standards[12] for heavy duty GHG Phase 1 emissions beginning with model years 2014. Note that these decreases are estimated, despite

[10] https://www.epa.gov/moves/what-does-moves-assume-future-year-fleet-fuel-efficiency

[11] USEPA (2012). 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (77 FR No. 199, October 15, 2012)

[12] USEPA (2011). Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (76 FR 57106, September 15, 2011)

projected population growth in the region. The GHG emissions associated with generating electricity to support EV usage is zero in 2005 because essentially there were no EVs in the vehicle fleet in 2005.

2 What Would it Take to Achieve the Regional Goals within the On-Road Transportation Sector? ("Top Down" Analysis)

In response to questions about what it would take to meet the regional GHG reduction goals within the on-road transportation sector, the study team conducted a "top-down" analysis to identify what would be required to achieve the 2030 and 2050 GHG reduction goals through two of the three pathways previously described - VMT reduction alone and vehicle technology/fuel changes alone. This effort explored three key questions posed by the TPB:

1) What level of VMT reduction would be needed to meet the regional 2030 and 2050 goals if VMT reduction were the sole focus of efforts?
2) What level of electric vehicle (EV) adoption would be needed to meet the regional 2030 and 2050 goals if vehicle technology were the sole focus of efforts?
3) What level of VMT reduction would be needed to meet the regional 2030 goal assuming vehicle technology assumptions in the Climate and Energy Action Plan (2030 CEAP)?

This "top-down" analysis was not intended to identify how such levels of reductions could be achieved or how feasible such outcomes would be, but simply to identify what level of change would be needed in terms of VMT and/or EV adoption to meet the goals. Based on a request from the TPB Technical Committee, the research team also conducted an analysis of VMT reduction that would be needed to meet the regional 2030 goal using vehicle technology assumptions in the 2030 CEAP. The TSMO pathway was not analyzed as a stand-alone strategy as part of the "top-down" analysis since the literature review suggested that the levels of GHG reduction required to meet the region's aggressive 2030 and 2050 goals would not be possible through TSMO strategies alone.

The analysis relied primarily on simple assumptions about vehicle travel and emissions rates under the baseline forecast for 2030 and 2050 (this baseline forecast is described in the Executive Summary and in Section 1), and mathematically calculated the level of VMT or EV adoption that would be needed, holding other factors constant (note that the baseline forecast assumes reductions in VMT per capita associated with the region's Long-Range Transportation Plan, *Visualize 2045*, as well as some improvements in vehicle technology). The analysis was conducted focusing on both direct tailpipe and evaporative emissions from motor vehicles (often described as "mobile source" emissions) and upstream emissions associated with electricity use for EVs, which makes this study different from the performance analysis conducted on Visualize 2045.[13]

[13] The goal level for transportation emissions was calculated based on the 2005 inventory estimate of 20.75 million metric tons of carbon dioxide equivalent (MMT CO_2 Eq.) emissions from on-road sources, yielding a 2030 goal of 10.38 MMT CO_2 Eq. (50% reduction) and a 2050 goal level of 4.15 MMT CO_2 Eq. (80% reduction). Rail emissions, including those from diesel trains (commuter rail, freight) and electricity used for transit, have been estimated but were not accounted for in calculating the goal level of emissions, given further work needed to forecast future rail activity and transit rail electricity consumption for 2030 and 2050. These emissions are approximately 1% of the on-road emissions in 2005.

VMT Reduction Alone

To explore what level of VMT reduction would be needed, the research team assumed that the emissions profile of the vehicle fleet for each category of vehicles would stay the same as under the baseline forecast. It was assumed that VMT reduction would occur for passenger travel (in passenger cars and light-duty trucks, which include sport utility vehicles, minivans, and pickup trucks), but not among buses or medium- and heavy-duty vehicles such as commercial trucks, freight trucks, or garbage trucks. Most MSTB strategies focus on passenger travel by encouraging shifts from driving alone to transit, ridesharing, bicycling, or walking, or by reducing trip-making through telework and other substitutes for travel.

The analysis suggests that achieving the 50% and 80% GHG reduction goals compared to 2005 levels solely through VMT reduction would require the following:

- In 2030, **passenger VMT would need to be reduced by 57% from the 2018 level.** Total passenger travel in light-duty vehicles (including passenger cars, light-duty trucks, and motorcycles),[14] would need to be held to no more than 16.27 billion vehicle miles annually in 2030, down from an estimated 38.11 billion vehicle miles in 2018. Given that the region's population is forecast to grow from about 5.57 million in 2018 to 6.25 million in 2030 and VMT otherwise is expected to increase, this equates to a 61% reduction in passenger VMT compared to the forecast levels in 2030 (forecast to be 42.23 billion VMT in 2030). Passenger VMT per capita would need to drop from an average of 18.74 vehicle miles daily in 2018 to 7.13 vehicle miles daily in 2030 – a 62% reduction (compared to a forecast level of 18.52 vehicle miles daily in 2030).
- In 2050, it is **not possible to get to the 80% reduction goal through passenger VMT reduction alone**. Even if all passenger VMT were eliminated, emissions from medium- and heavy-duty vehicles, including light-commercial trucks, freight/refuse trucks, and buses, are estimated to exceed the 2050 goal level of emissions of 4.15 million metric tons by 2.24 million metric tons.[15] Because these vehicles perform essential commercial functions, VMT reduction from public and commercial vehicles are not generally expected to occur, and MSTB strategies generally focus on shifting people from driving to transit, ridesharing, walking, bicycling, and other modes, rather than reducing travel from freight/commercial trucks and buses.

Figure 3 shows that while VMT per capita is forecast to decline in the region under existing plans, the level of reduction in passenger VMT per capita needed to meet the goal through VMT reduction alone would be extremely large. Figure 4 shows the total passenger VMT reduction required in the region to meet the 2030 and 2050 goals. These figures illustrate that it is not possible to meet the 2050 goal through passenger VMT reduction alone.

[14] These figures do not include VMT by light commercial trucks, medium- and heavy-duty trucks (such as those used in freight, refuse collection, and construction), or buses. Note that passenger travel in this analysis includes all travel in light-duty passenger vehicles, including those used by households and for business purposes.

[15] The 2050 figures were calculated using the 2045 forecasts of VMT and on-road emissions from the region's Visualize 2045 plan and extrapolated to 2050, with no further improvement in emissions rates.

Figure 3. Daily Passenger VMT per Capita Required to Meet GHG Goals through VMT Reduction Alone[16]

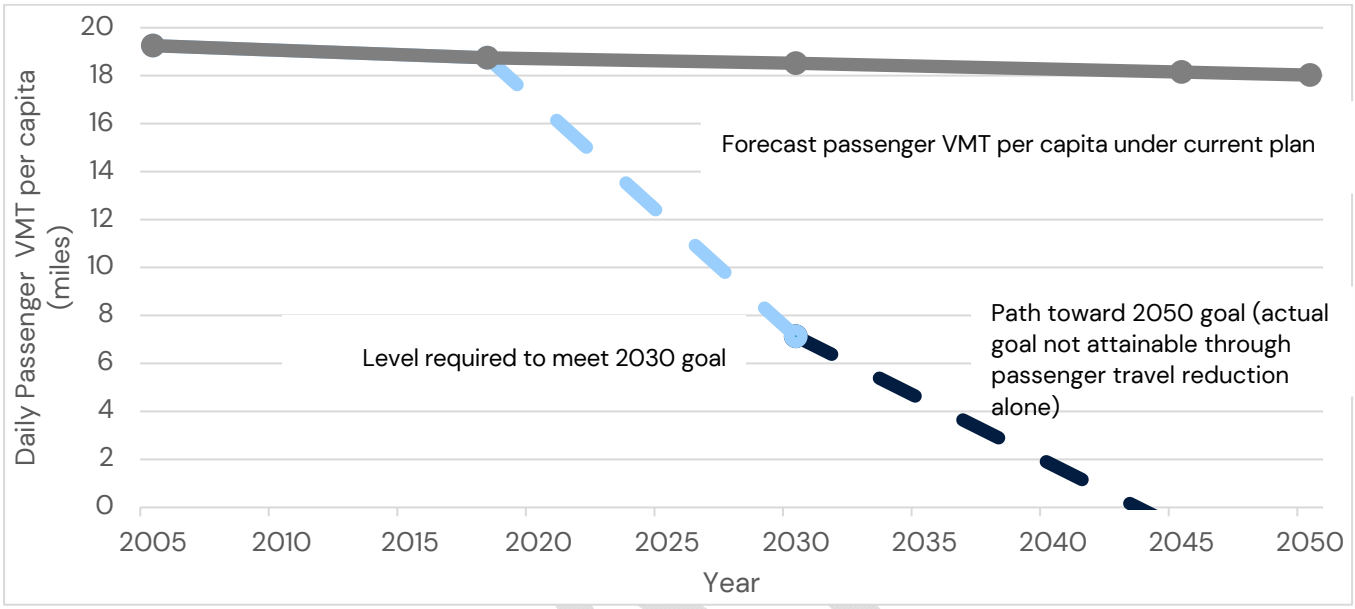
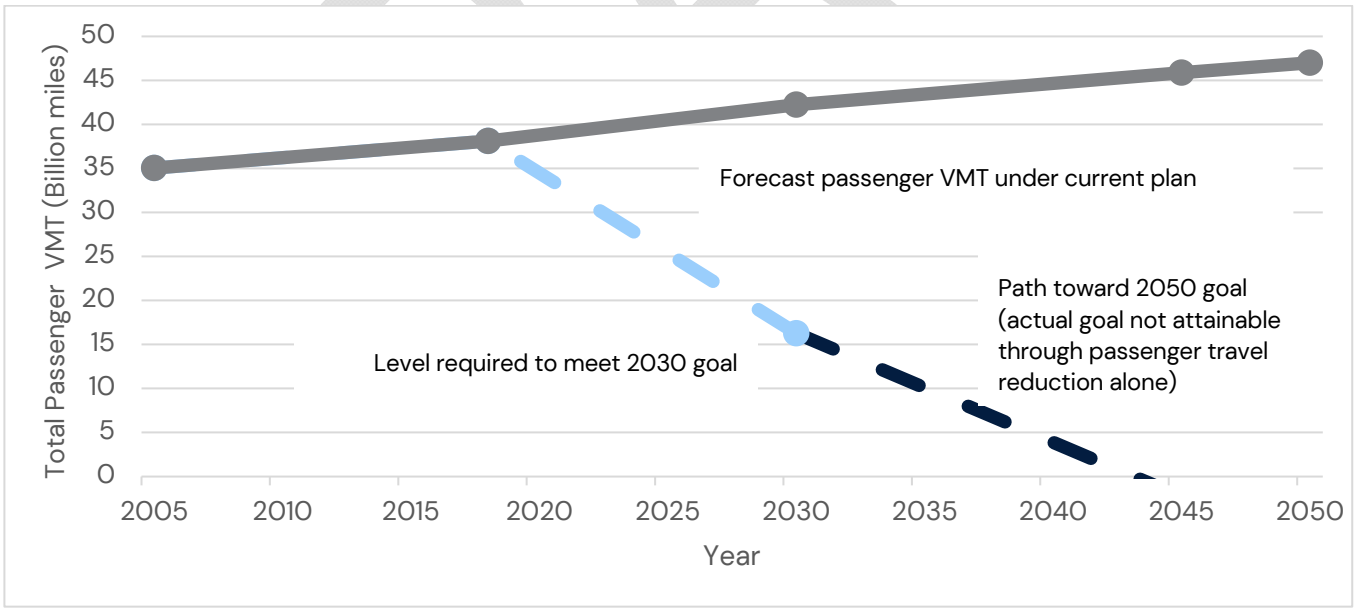


Figure 4. Annual Total Passenger VMT Required to Meet GHG Goals through VMT Reduction Alone



[16] Baseline passenger VMT per capita was calculated based on COG population and VMT projections for passenger cars and passenger trucks. Required per capita VMT was calculated by solving for the passenger VMT level needed to achieve the 50% emissions reduction by 2030 and 80% emissions reduction by 2050 using average passenger vehicle emissions rates in the target year. This VMT was then divided by the projected COG population in the target year.

These results suggest that it would be extremely challenging, if not unrealistic, to meet the 2030 goal with VMT reduction strategies without further vehicle technology improvements. Particularly for 2030, just nine years away, the levels of VMT reduction needed (if that pathway alone were pursued) to achieve the goal would require unprecedented levels of reduction in driving – slightly larger reductions than seen at the peak of pandemic stay-at-home orders in April 2020, when all schools and many businesses were closed or employees told to stay home, and regional traffic volume dropped by about 50% temporarily (by July 2020, while most schools and businesses continued to be on-line/remote-only, traffic volumes had recovered to about 80% of pre-pandemic levels).[17] Sustained traffic reductions at such a level would likely require very high levels of pricing (parking pricing, road pricing, and/or fuel pricing), near complete telework for eligible workers, and/or restrictions on driving. Moreover, the reduction in VMT would need to be occurring over a time when the region's population is forecast to increase by 12% (between 2018 and 2030).

As a point of comparison, California metropolitan planning organizations (MPOs) have VMT reduction goals with targets generally ranging from a 13% to 19% reduction in VMT per capita by 2035 relative to 2005,[18] and these MPOs have faced challenges demonstrating how such levels of reductions in VMT per capita could be met. Also note that these are VMT per capita targets for California MPOs, and regional levels of VMT for large MPOs are forecast to increase due to population growth even if the VMT per capita targets are met.

Vehicle Technology Alone

Based on an analysis of vehicle stock and GHG emissions, the research team estimated what level of EVs (or other forms of ZEVs such as fuel cells) in the fleet would be necessary to achieve the 50% and 80% GHG reduction goals solely through technology adoption, without any changes in forecast VMT. This analysis used very simplified assumptions (such as assuming proportionate EV adoption across vehicle classes) and no other improvements in low-carbon fuels. Fuel economy improvements for internal combustion engine (ICE) vehicles from the baseline forecast were preserved. The simplified analysis suggests that the following would be required, with results shown in Figure 5 for the reference electricity emissions case (which assumes some improvements in carbon intensity from electricity generation) and Figure 6 for the clean grid electricity emissions case (which assumes a path to net zero emissions from electricity generation by 2035).[19] Assumptions for the Reference Case and Clean Grid Case are described further in Section1.

- In 2030, the **average emissions rate of all vehicles** (across light-, medium-, and heavy-duty vehicle classes) **would need to be reduced by 56% compared to the 2018 level**, while in the baseline forecast,

[17] Canan, Tim. "Transportation Impacts of the COVID-19 Pandemic in the National Capital Region." Presented at the January meeting of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, January 21, 2021. https://www.mwcog.org/events/2021/1/21/transportation-planning-board/.

[18] California Air Resources Board. "SB 375 Regional Plan Climate Targets."2021 https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets.

[19] This calculation involved estimating the percent of VMT that would be needed from EVs in 2030 and 2050, calculated using estimated net emissions benefits of switching to EVs for each vehicle type weighted by the estimated VMT distribution.

emissions rates are expected to decline by about 25% over this time period (reflecting policies[20] expected to improve the average fuel economy of the fleet, including increased EV adoption in the baseline forecast). These figures essentially mean that average vehicle fuel economy of vehicles on the road must more than double between 2018 and 2030. To get to these levels, only considering direct mobile source emissions (not accounting for emissions from electricity consumption), approximately 44% of vehicles on the road would need to be EVs in 2030 (compared to 2018 levels of less than 1%), assuming proportionate reductions across vehicle classes (passenger cars and trucks, buses, medium- and heavy-duty trucks, etc.) and no other improvements in low-carbon fuels or vehicle fuel economy in the rest of the fleet.[21] When accounting for emissions from electricity used to charge electric vehicles, achieving a 50% overall reduction in GHG emissions compared to 2005 levels would require **approximately 75% of the vehicles on the road to be EVs** in 2030,[22] based on ICF's assumed Reference Case for carbon intensity of electricity, which assumes improvements in electricity carbon intensity based on current on-the-books policies. The share of vehicles that need to be EVs would be lower with an even cleaner electric grid. In the Clean Grid Case, achieving a 50% overall reduction in GHG emissions compared to 2005 levels would require approximately 48% of the vehicles on the road to be EVs in 2030.[23] ICF's assumptions for the Reference Case and Clean Grid Case are described in Section1.

- In 2050, the **average emissions rate of all vehicles** (across light-, medium-, and heavy-duty vehicle classes) **would need to be reduced by 84% compared to the 2018 level,** while in the baseline forecast, emissions rates are expected to be reduced by about 32% over this time period (as the most significant benefits of existing fuel economy standards have largely already been achieved well before 2050). When accounting for emissions from electricity generation, **achieving the 2050 goal level would not be attainable, based on ICF's assumed Reference Case electricity emissions factors** for the region.[24] In the Clean Grid Case, achieving an 80% reduction in GHG emissions compared to 2005 levels would require approximately 79% of the vehicles on the road to be EVs in 2050.

[20] Emissions rates were derived from MOVES2014b outputs for 2005, 2018, and 2030 from the 2030 CEAP, for 2045 from the 2020 Amendment to Visualize 2045, and for 2050, the same 2045 emissions rates were assumed for internal combustion engine vehicles. These reflect the 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards promulgated in 2012, rather than the Safer Affordable Fuel Efficient (SAFE) Vehicles Final Rule for Model Years 2021-2026, promulgated in 2020 and currently under review and consideration for replacement with more stringent standards.

[21] If only focusing on passenger cars and trucks, about 64% of passenger cars and trucks on the road would need to be EVs, assuming other classes of vehicles follow the baseline forecast, if only accounting for tailpipe emissions.

[22] For purpose of this analysis and the figures reported, we assume that the average mileage driven is similar for EVs and internal combustion engine vehicles. These calculations assume proportional EV deployment across all vehicle types for simplicity of presentation. The bottom-up scenarios explored different assumptions regarding the shares of EVs across different types of vehicles (passenger cars and trucks, buses, medium- and heavy-duty trucks, etc.).

[23] Note that VMT is forecast to increase between 2005 and 2030, while emissions rates from internal combustion engine vehicles are anticipated to decline over this period due to improvements in vehicle fuel economy; this clean grid case does not assume an entirely zero emissions electric grid by 2030 but by 2035.

[24] Assumptions are similar to those for 2030.

Figure 5. Forecast VMT by Technology Type Required to Meet GHG Goals through Shifts to EVs Alone, Reference Case for Electricity Carbon Intensity

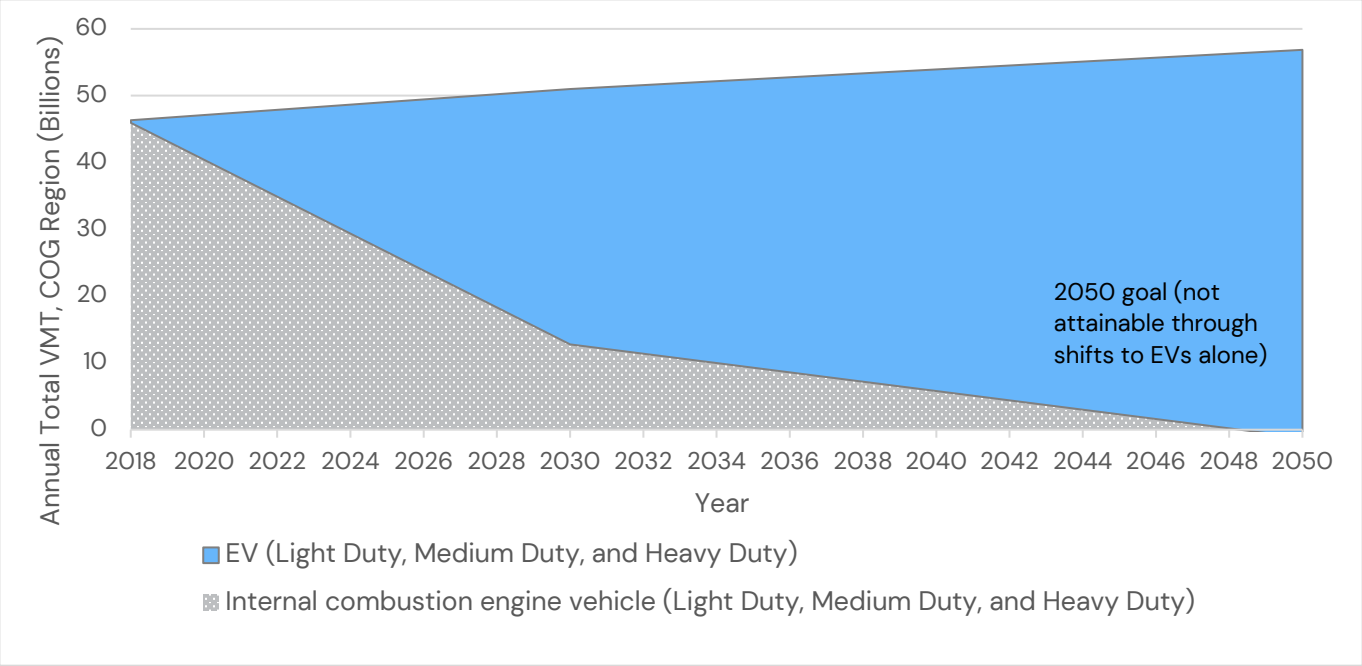
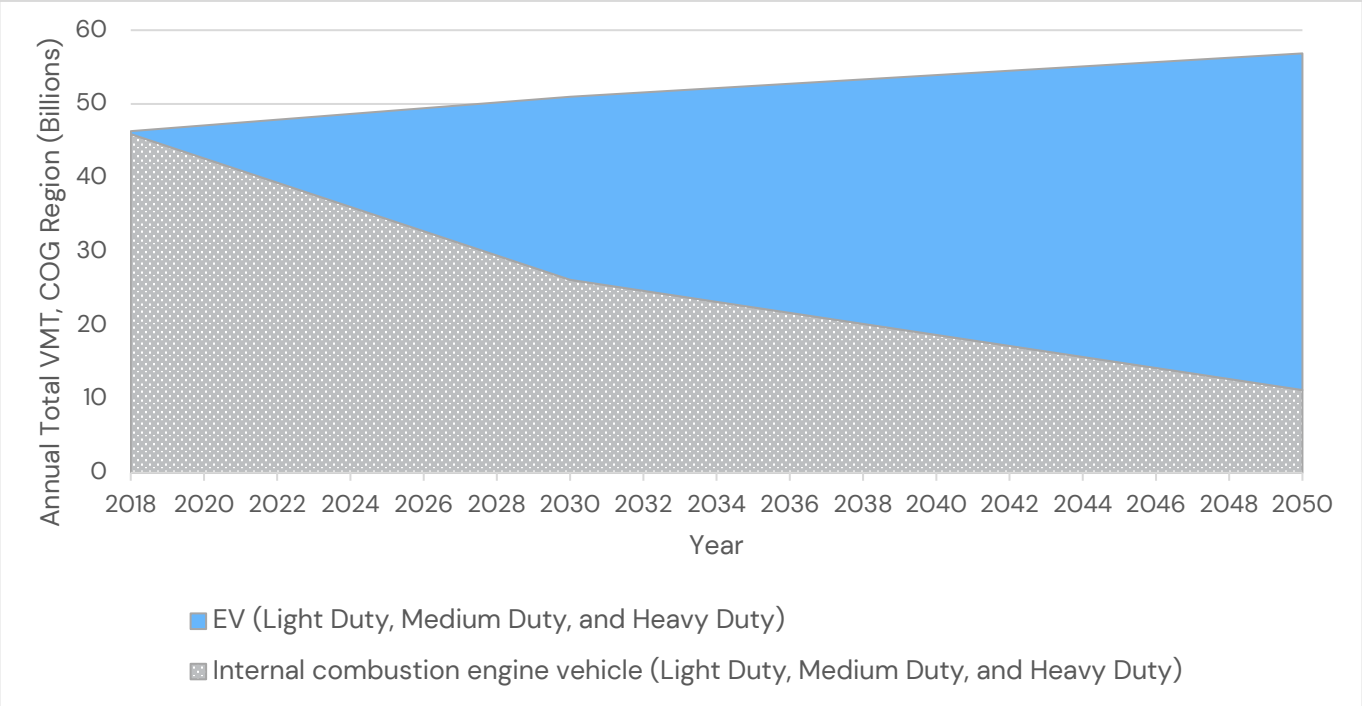


Figure 6. Forecast VMT by Technology Type Required to Meet GHG Goals through Shifts to EVs Alone, Clean Grid Case



Similar to the difficulty associated with VMT reduction needed by 2030, achieving the dramatic changes in the vehicle fleet by 2030 needed to achieve the 2030 GHG goal through shifts to EVs alone appears extremely challenging. The baseline forecast assumes that EVs would make up approximately 6% of VMT in 2030, so increasing that share to 75% is a dramatic change in the fleet. This level of fleet change would be very difficult to achieve by 2030 with the typical timeframes that vehicles are held and rate of turn-over in the fleet. Such an outcome would likely require nearly immediate shifts to having all new vehicles sold as EVs, combined with aggressive consumer incentives including buy-back programs for vehicles to accelerate the rate at which consumers opt for new vehicles, rapid deployment of EV-infrastructure, full public sector fleet conversions to EVs, and/or increases in carbon or fuel pricing to help spur demand. The literature review suggested that even under aggressive scenarios where EV sales ramp up to 100% of new passenger vehicles sold in 2030, EVs may still make up just about a quarter of all vehicles on the road, given the large number of conventional vehicles that would remain in the fleet.

Given the additional twenty years to meet the 80% reduction goal by 2050, it appears that a full-scale shift to EVs could potentially enable attainment of the goal to be met through vehicle technology changes (without new VMT reduction efforts) with assumptions for a clean power grid, through nearly universal shifts to EVs across most classes of vehicles. However, there are risks to meeting the goal with such an approach if the fleet does not turn-over as quickly as anticipated. Moreover, during the transition time period to EVs, reducing vehicle travel through strategies that enhance transit and other non-auto travel options is typically viewed as a "no regrets" approach that can yield multiple benefits. Importantly, given the cumulative nature of GHG emissions in the atmosphere, the level of emissions over the intervening time between now and 2050 is an important consideration, and MSTB strategies can play an important role in reducing emissions over the time period when the fleet is transitioning to EVs and the power grid is decarbonizing.

VMT Reduction under the 2030 CEAP Technology Assumptions

Following the initial analysis, the TPB requested to understand what level of VMT reduction would be required to meet the region's 2030 goal under the vehicle fleet technology assumptions used in the region's 2030 CEAP. Using the NREL[25] High Scenario EV penetration for the vehicle fleet and the Reference Case electric grid assumptions, which are similar to the improvements in the electric grid included in the 2030 CEAP, to meet the 50% emissions reduction goal in 2030 in on-road transportation sources, it is estimated that **passenger VMT would need to be reduced by 49% from the 2018 level**. Total passenger travel in light-duty vehicles, would need to be held to no more than 19.62 billion vehicle miles annually in 2030, down from an estimated 38.11 billion vehicle miles in 2018, as shown in Figure 7. Given that the region's population is forecast to grow by about 12% from 2018 to 2030, and VMT otherwise is expected to increase, this equates to a 54% reduction in passenger VMT compared to the forecast levels in 2030. Passenger VMT per capita would need to drop from an average of

[25] NREL. (2018). Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States

18.74 vehicle miles daily in 2018 to 9.6 vehicle miles daily in 2030 (compared to a forecast level of 18.52 vehicle miles daily in 2030), as shown in Figure 8.

Figure 7. Annual Total Passenger VMT Required to Meet GHG Goals, assuming 2030 CEAP EV Conversion and ICF Reference Electricity Emissions

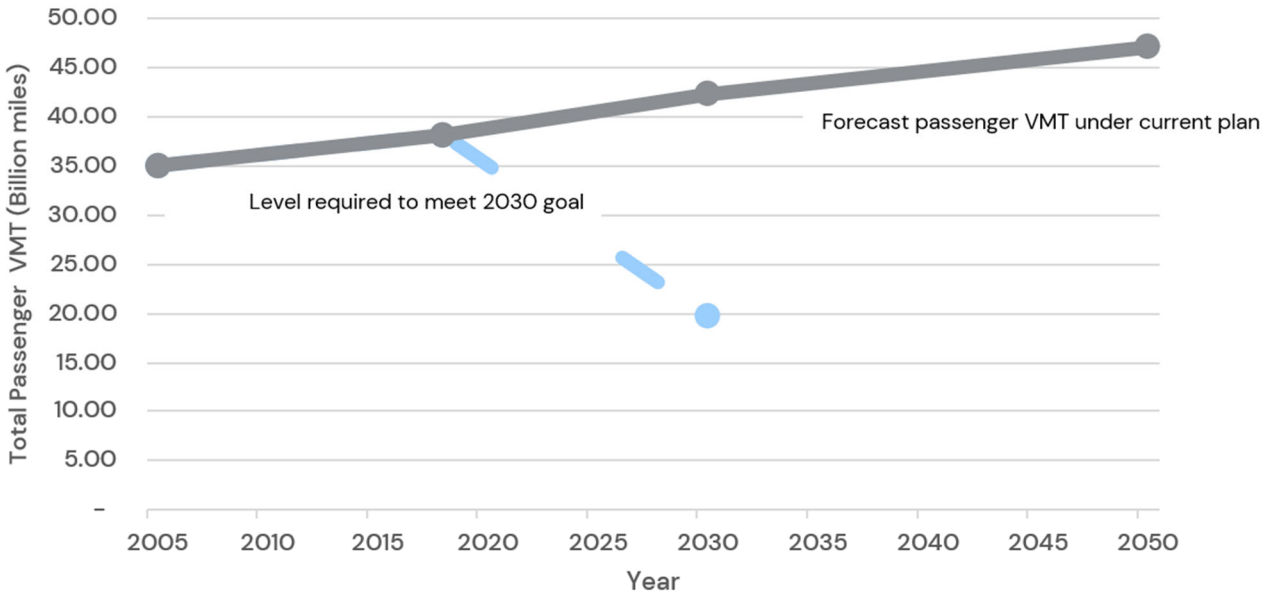
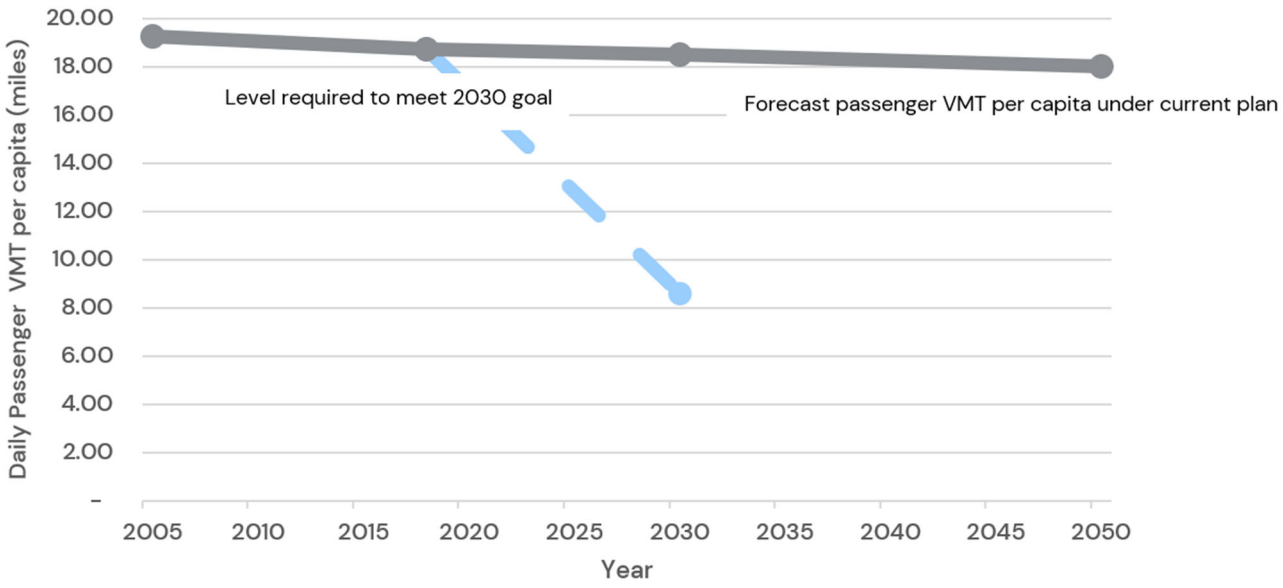


Figure 8. Daily Passenger VMT per Capita Required to Meet GHG Goals, Assuming 2030 CEAP EV Conversation and ICF Reference Electricity Emissions



Implications

The simple top-down analysis of what it would take to reach the 2030 or 2050 goals highlights how challenging it would be to reach the goals set, particularly for 2030, through either VMT reduction alone or shifts to EVs alone, and also highlights the overall challenge of meeting the goals even with technology assumptions in the 2030 CEAP. The small number of years between today and 2030 means there is very limited time to achieve the large shifts in fleet technology or VMT that would be required to meet the goal for 2030. However, by 2050, there is more time for the fleet to turn-over and for EVs to be brought into the fleet.

3 Scenario Development and Analysis Approach ("Bottom-Up" Analysis)

Following the "top-down" scenario analysis that helped to inform what it would take to reach the 2030 and 2050 goals through VMT reduction and EV adoption strategies, the study focused on developing and analyzing a set of ten "bottom-up" scenarios that include a variety of strategies and implementation levels across the three carbon reduction pathways. The purpose of this scenario analysis was to estimate the GHG reductions that might be achieved through implementation of different strategies, and combinations of strategies, to reach the goal of reducing on-road, transportation sector GHG emissions 50% by 2030 and 80% by 2050, compared to the 2005 level or emissions.

Development of Scenarios

The ten scenarios were defined with a focus on including promising strategies across each of the three primary carbon reduction pathways for on-road transportation sources – vehicle technology and fuels strategies, mode shift and travel behavior (MSTB) strategies, and transportation systems management and operations (TSMO) strategies – as well as including combinations of strategies across these pathways. To attempt to meet the goals, aggressive assumptions were selected regarding implementation of strategies and high-end estimates of potential for shifts of vehicle sales for EVs, telework adoption, transit enhancements, TSMO deployment, and other strategies over the timeframe through 2050. These assumptions generally went beyond assumptions used in prior regional studies, such as the "What Would it Take?" Scenario Study, the Multi-Sector Working Group study, and the Long-Range Plan Task Force study and were developed taking into consideration the strategies in the region's 2030 CEAP. Moreover, the literature review conducted for this study provided a basis for identifying GHG strategies to include in scenarios and to consider for modeling and analysis, based on research on potentially promising GHG reduction strategies.

Specifically, vehicle technologies and fuels strategies were defined by taking into consideration existing policies and goals including:

- President Biden's goals to have 50% of new passenger vehicle sales to be EV by 2030.
- The California Air Resources Board (CARB) Zero-Emission Vehicle (ZEV) Program, adopted by Maryland and Virginia, which requires auto manufacturers to deliver a minimum percentage of passenger cars and light-duty trucks as ZEVs each year.
- The California Advanced Truck Rule Memorandum of Understanding (MOU), signed by 15 states including Maryland and the District of Columbia, which aims at making at least 30% of all new medium- and heavy-duty sales to be zero-emission by 2030.

- Incentives, such as Maryland's excise tax credit for EVs and plug-in hybrids and rebates on the cost of electric vehicle supply equipment; and the District of Columbia's tax exemption for EVs and high efficiency vehicles, as well as a tax credit for alternate fuel infrastructure.[26]
- The multi-state Transportation and Climate Initiative (TCI), which proposed a regional cap-and-invest program (TCI-P) that would set a decreasing cap for transportation emissions in the region and generate proceeds to advance clean transportation.[27]

For the MSTB and TSMO strategies, the team explored existing plans in the region, as well as national and international research on potentially effective investments and strategies related to land use, transit, bicycling and walking, telework, and other approaches, and considered possible future changes due to deployment of connected and automated vehicle (CAV) technologies.

Different scenarios with varying implementation levels of the strategies listed above were created under each pathway, both with aggressive and even more aggressive (or "amplified") strategy assumptions. Input from the TPB and its Technical Committee was used to refine the strategy assumptions for the scenarios.

In total, the analysis was performed on ten distinct scenarios, six focused on individual pathways (two vehicle technology and fuels focused [denoted as VT.1 and VT.2], three MSTB focused scenarios [denoted as MS.1, MS.2, and MS.3 below], and one TSMO scenario) and four combinations of the above scenarios. The combination scenarios were created in such a way to give equal weight to the moderate VT and MS scenarios (VT.1 + MS.1 + TSMO, or COMBO.1) or to emphasize either the vehicle technology (VT.2 + MS.1 + TSMO in COMBO.2) or the mode shift (VT.1 + MS.3 + TSMO in COMBO.3). A fourth combination scenario (COMBO.4) merged the most aggressive actions from all pathways and added assumptions for adoption of Connected and Automated Vehicles (CAVs).

Each scenario was analyzed to estimate GHG impacts in 2030 and 2050 under three different future electric grid scenarios, described further below. Table provides a summary of all scenarios considered under each of the three primary pathways, plus the combination scenarios.

[26] The Virginia EV Incentive Working Group has finalized a Feasibility Report in November 2020 that also highlights the need for Virginia to put in place strong incentives for clean vehicle technologies.

[27] Three states (Connecticut, Rhode Island, and Massachusetts) and the District of Columbia signed the Memorandum of Understanding to participate in TCI-P in December 2020. As of the time of the publication of this report, the District is the only remaining signatory to TCI-P, which requires at least three signatories to begin the program. There has been no announcement from TCI on the future of TCI-P or other initiatives that make take its place.

Table 3. Ten Scenarios Studied in "Bottom-Up" Analysis

Pathway	Scenario	Key Components / Assumptions
Vehicle Technology (VT) and Fuels	VT.1: Vehicle Technology and Fuels Improvement Scenario	Shifts to EVs (50% of new light-duty [LD] vehicle sales are EVs in 2030, with 100% by 2040; 30% of new medium/heavy-duty [M/HD] truck sales are EVs in 2030, with 100% by 2050; 50% of buses on the road are EVs in 2030, 100% in 2050; biodiesel/renewable diesel makes up 10% of diesel fuel use in 2030 and 20% in 2050)
	VT.2: Amplified Vehicle Technology and Fuels Improvement Scenario	More aggressive shifts to EVs: 100% of new LD vehicle sales are EVs in 2030; 50% of new M/HD truck sales are EVs in 2030, with 100% by 2040; 100% of buses on the road are EVs by 2030; biodiesel/renewable diesel makes up 20% of diesel fuel use in 2030 and 30% in 2050
Mode Shift and Travel Behavior (MSBT)	MS.1: Mode Shift Scenario	Land use changes focused on redistribution of future growth to activity centers and areas better served by transit across jurisdictions and 77,000 new households in the region by 2030 and 126,000 new households in the region by 2050 to support jobs-housing balance; enhanced bike/pedestrian/micromobility environment; transit fares reduced 50% by 2030 and 75% in 2050; all workplace parking in activity centers priced by 2030; transit enhancements (10% reduction in transit travel time by 2030 and 20% by 2050); 25% telework
	MS.2: Mode Shift Scenario + Road Pricing	Same strategies as MS.1, plus DC cordon pricing of $10 to enter downtown, and VMT-fees of $0.05 per mile in 2030 and $0.10 per mile in 2050
	MS.3: Amplified Mode Shift Scenario + Road Pricing	MS.2 with amplified strategies, including free transit; all workplace parking priced by 2050 (not just in activity centers), further transit enhancements (15% reduction in transit travel time by 2030 and 30% by 2050); 40% telework[28]
Transportation Systems Management & Operations (TSMO)	TSMO: Operations Improvement Scenario	Optimized operations through intelligent transportation systems (ITS) including ramp metering, incident management, active signal control, and active transportation demand management; assumed operational benefits from connected/automated vehicles (CAVs) in 2050
Combined Pathways	COMBO.1: Combined Scenario	VT.1 + MS.1 + TSMO
	COMBO.2: Combined Scenario with More Aggressive Technology Emphasis	VT.2 + MS.1 + TSMO
	COMBO.3: Combined Scenario with More Aggressive Mode Shift Emphasis	VT.1 + MS.3 + TSMO
	COMBO.4: Combined Scenario with Aggressive Actions Across All Pathways and Shared CAV Future	VT.2 + MS.3 + TSMO + shared CAV assumptions

[28] Since only 50% of jobs in the metropolitan Washington region are telework capable, 40% telework implies that 80% of employees who work in telework-capable jobs would be teleworking on a typical workday, which is a very aggressive assumption.

Analysis Approach

In selecting an analysis approach, the team evaluated several approaches and modeling tools to choose the best ones that could feasibly support the scenario analysis of different types of transportation strategies and vehicle GHG emission reductions. The team selected to use several analysis methods and tools whose outputs were integrated as depicted in Figure 9. A list of the primary tools and methods is provided below:

- The Argonne National Laboratory's VISION[29] model was used to estimate the market shares of alternative technologies (e.g., EVs) and fuels (e.g., renewable diesel and biofuels) across vehicle classes covering light-, medium-, and heavy-duty vehicle technologies. The market penetration of EVs and other flex fuels overtime was obtained using the new vehicle sale percentages defined by the ICF team for each VT scenario as inputs, compared in relation to a baseline forecast using the Energy Information Administration's (EIA's) Annual Energy Outlook projections ending in the year 2050. **The modeling performed with VISION provided fleet-level estimates of VMT for different vehicle classes across sectors.**
- The regional travel demand forecasting model was used to analyze land use changes as part of the MSTB scenarios. The ICF team used the COG/TPB Travel Demand Forecasting Model, Version 2.3.78 (March 18, 2020),[30] which has been previously used as part of the region's long-range transportation planning for the regional air quality conformity analysis of the 2020 Amendment to the Visualize 2045 Long-Range Transportation Plan. **The regional travel demand forecasting model produced VMT estimates for the land use strategies and provided other outputs (e.g., mode shares) used as inputs to sketch planning approaches used for other MSTB strategies.**
- The TRIMMS[31] (Trip Reduction Impacts of Mobility Management Strategies) sketch planning tool was chosen to estimate the impact of MSTB strategies that affect the cost of travel (VMT-fees, cordon pricing, parking pricing, transit pricing) and transit service enhancements. TRIMMS can handle interactions among multiple policy measures and levels of strategies, and it has been utilized in prior analysis for COG's Multisector Work Group (MSWG) and has been applied extensively in metropolitan areas around the country for analysis of transportation GHG reduction strategies. **The TRIMMS analysis provided VMT estimates for each of the modeled strategies, which were used to calculate GHG emissions.**

[29] "VISION Model: Argonne National Laboratory." VISION Model. Argonne National Laboratory. Accessed August 23, 2021. https://www.anl.gov/es/vision-model.

[30] Ray Ngo, Feng Xie, and Mark S. Moran, "User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.78" (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, April 14, 2020), https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/.

[31] Sisinnio, Concas. TRIMMS. Center for Urban Transportation Research, University of South Florida. Accessed August 23, 2021. http://trimms.com/.

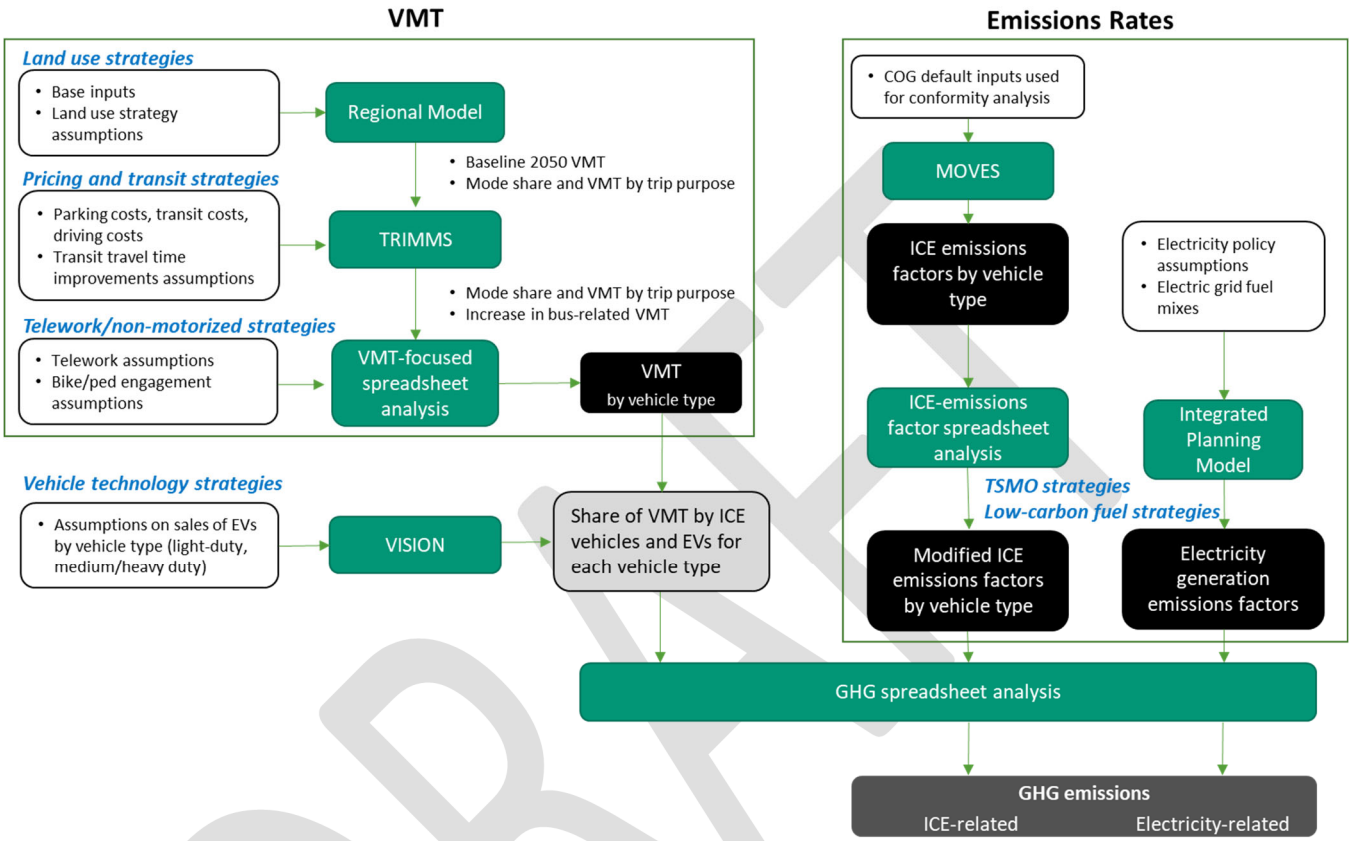
- Sketch planning and spreadsheet analysis was used to model the impacts of biofuels (under the VT scenarios) telework and bicycle/pedestrian/micromobility strategies (under the MS scenarios), and TSMO strategies such as extensive Intelligent Transportation Systems (ITS)/incident management deployment to optimize traffic flow and increased connected/automated vehicles (CAVs) in 2050. The analyses were based on literature findings regarding potential effects of these strategies. For instance, the effects of TSMO strategy deployment were based on previous simulation studies estimating the impacts of TSMO strategies and ecodriving on GHG emissions profiles for vehicles. Projections of CAV penetration based on early modeling by the Department of Energy were included in the 2050 results for the TSMO strategies. **The sketch modeling of various strategies produced estimations of changes in emissions factors and/or VMT, which were used to calculate GHG emissions estimates.**
- ICF's Integrated Planning Model (IPM) was used to calculate GHG emissions associated with electricity use for EV charging. IPM is a multi-regional, dynamic, deterministic linear programming model of the U.S. electric power sector developed by ICF. IPM allows forecasting future electric grid emissions rates based on energy demand as well as environmental, transmission, dispatch, and reliability constraints, and it was set up to incorporate region-specific electricity decarbonization policies such as the Virginia's Clean Economic Act (100% clean power by 2045), Maryland's Renewable Portfolio Standard (50% renewable energy by 2030) and the District of Columbia's Renewable Portfolio Standard (100% renewable energy by 2032). **The analysis performed with IPM provided grid emission factors that were applied to calculate EV-related GHG emissions.**

The VMT numbers resulting from these analyses were then collected into a master spreadsheet for conversion to GHG emissions (in MT of CO2 equivalent or CO2e) using vehicle and fuel specific fuel economy values, provided in the form of emission factors (EF, in g CO2/mile) for Internal Combustion Engines (ICE) vehicles and kilowatt-hours per mile (kWh/mi) for EVs. The EF values for conventional ICE fuels were obtained from the EPA's MOVES[32] (Motor Vehicle Emission Simulator) outputs, to remain consistent with baseline data used in COGs 2030 Climate and Energy Action Plan. The MOVES outputs provided by COG to ICF were generated using MOVES 2014b, the version that had been used for the Visualize 2045 plan (2018) and 2030 CEAP to remain consistent with previous analyses. The Argonne National Laboratory Alternative Fuel Life-cycle Environmental and Economic Transportation (AFLEET) Tool provided fuel economy values for most EV types; ICF supplemented values when needed for EVs and biofuels using industry data. All EV fuel economy values were then converted into EF values in g CO_2e/mile before being combined with electricity EF values from IPM to determine the GHG emissions associated with EV charging.

[32] The latest version of the MOVES model, MOVES3, was released in March 2021, and it includes updated data on vehicle populations, travel activity, and emission rates as well as updated fuel supply information at the county level. It also incorporates the impacts of the Heavy-Duty Greenhouse Gas Phase 2 rule and the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule. "MOVES and Other Mobile Source Emissions Models." EPA. Environmental Protection Agency. Accessed August 23, 2021. https://www.epa.gov/moves.

The supplemental **Technical Appendix** describes in detail the analysis of the baseline forecast and steps for all scenarios (VT, MSTB, and TSMO). The Technical Appendix also includes the assumptions as well as the input parameters that were chosen when setting up the modeling tools used in the study.

Figure 9. Overview of Analysis Tools and Methods Used in the Study



The analyses for all scenarios involved analyses of individual vehicle classes (e.g., passenger vehicles, commercial vehicles, buses, etc.), reflecting different levels of VMT and emissions rates, and changes for each, as applicable. It should be noted that while the analysis provides a strong basis for estimating the GHG emissions effects of each of the scenarios, the analysis does not account for many indirect effects of strategies. For instance, the analysis did not explicitly account for improvements in vehicle fuel economy associated with MSTB strategies that are expected to yield significant improvements in traffic congestion and did not estimate potential induced vehicle travel demand from shifts to EVs, which may reduce the cost of driving, as it was assumed implicitly that additional revenue generation mechanisms would be applied for these vehicles.

Vehicle Technologies (VT) and Fuel Improvement Scenarios

The VT scenarios (VT.1 and VT.2) included interventions that improve the fuel economy of conventional vehicles, a shift to fuels with a lower carbon content (e.g., biodiesel, renewable diesel), and replacing internal combustion engine vehicles with EVs, thus eliminating tailpipe emissions. In this analysis, EVs included both battery electric vehicles, BEVs, and plug-in hybrid vehicles, PHEV.

The analysis for the VT scenarios relied on the combination of the VISION model and sketch modeling. The VISION model was used to estimate the fleet penetration (or share of VMT) by different vehicle technologies and alternative fuels in 2030 and 2050 based on vehicles sale assumptions. After determining the VMT share of each vehicle and fuel type, GHG emission reductions (in MT CO2e) were calculated for years 2030 and 2050 as the difference, in comparison with the baseline forecast. Calculations were performed with and without including the GHG emissions from electricity generation for EV charging, to extract the GHG reduction resulting from eliminating tailpipe emissions. For biofuels, ICF relied on a report to the Oregon Department of Environmental Quality rulemaking process of the Clean Fuels Program[33] to extract reasonable percentage market shares of biodiesel and renewable diesel fuel by 2030 for defining the share of biodiesel/renewable diesel in the fleet. Average lifecycle emissions factors (g CO_2e per mile) for diesel, biodiesel (B20), and renewable diesel were estimated for light-duty commercial trucks, medium-duty trucks, and heavy-duty trucks using standard fuel energy density assumptions and pathway carbon intensity assumptions released by CARB.[34] The CO_2e savings per mile between lifecycle carbon emissions factors of conventional diesel and renewable or biodiesel was then used as an emissions "credit" to account for reduced upstream emissions associated with these fuels.

Mode Shift and Travel Behavior (MSTB) Scenarios

The MSTB scenarios (MS.1, MS.2, and MS.3) included interventions focused on shifting travel activity to modes that reduce VMT, primarily by reducing single-occupant vehicle (SOV) use. These typically include land use policies, increases in public transit use, ridesharing, bicycling, walking, and telework, as well as road and parking pricing schemes that discourages private vehicles use. The MSTB interventions modeled for this study included land use strategies, transit enhancements, pricing schemes for parking and roads, as well as transit price changes, telework, and non-motorized micromobility.

To perform these calculations, ICF used baseline forecasts of VMT from COG's outputs of Visualize 2045; the baseline value for 2030 was taken as is, while the forecast for 2050 had to be extrapolated using the regional travel demand forecasting model, since the out-year for Visualize 2045 was 2045. Similarly, the team modeled the incremental land use change between year 2045 and 2050 to create a baseline before applying the land-use strategies intended to reduce GHG emissions. The land use changes were modeled with the regional travel model and consisted of shifting population growth to activity centers and high-capacity transit (HCT) areas while adding new households to the region, using an approach similar to the analysis used for the Long-Range Plan Task Force. Pricing strategies involved changes in the price of vehicle travel (e.g., parking pricing and road pricing) and were incorporate along with changes in the cost of transit to assess potential synergistic effects. The analysis was performed by fine tuning model parameters to three different subareas (D.C. core, other activity centers, areas outside of activity centers) and two types of trips (work and non-work trips) to tailor the various MSTB strategies to different travel markets with unique trip characteristics and mode shares. Telework was assumed to reduce travel across all modes within the region including transit, bicycle, and walking trips

[33] https://www.oregon.gov/deq/rulemaking/Documents/cfp2021icf.pdf

[34] Average carbon intensities from LCFS certified pathways, 2019. https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities

proportionately to their mode share prior to the telework assumptions being added but assumed an increase in non-work trips for each teleworker and a small overall adjustment of VMT to reflect a rebound toward driving associated with significant improvements in travel speeds on the roadway network anticipated from large-scale reductions in peak-period driving. The effects of non-motorized micromobility strategies were estimated based on present uptake levels in Arlington, Virginia[35] of shared mobility devices applied across the region in 2030. This uptake level was doubled for 2050.

Transportation Systems Management and Operations (TSMO) Scenario

The Transportation Systems Management and Operations (TSMO) scenario assumed Intelligent Transportation Systems (ITS)/incident management deployment and increased Connected and Automated Vehicles (CAVs) adoption. CAVs offer the potential to improve traffic flows and enhance fuel economy through vehicle-to-vehicle and vehicle-to-infrastructure communications. An example of CAV application that is readily available is truck platooning, e.g., a platoon of two or more connected trucks traveling at the same speed and accelerating and braking together. However, for light-duty passenger vehicles, the impacts on CAVs have primarily been studied using model simulations of driving behaviors and small-scale proof of concept testing.

For the TSMO scenario analysis, ICF applied GHG emissions rate improvements to a portion of VMT through enhanced Intelligent Transportation Systems (ITS)/incident management and ecodriving using literature from simulation studies showing estimated effects of ITS and eco driving on vehicle emissions profiles, after accounting for potential increases in VMT. To model the effects of CAV, it was assumed that broad implementation of CAVs across all vehicle classes (light-, medium-, and heavy-duty) in 2050 yields fuel economy benefits similar to ecodriving.[36]

Combined Strategies

The scenarios COMBO.1, COMBO.2, COMBO.3, and COMBO.4 were created by coupling the VT, MS, and TSMO scenarios to explore the synergistic effects of combined pathways to reduce GHG emissions. The combined scenarios are particularly useful because they provide a realistic approach to what COG might be implementing to achieve the region's decarbonization goals, given that no single pathway can deliver the necessary GHG emission reductions. Furthermore, having a variety of transportation decarbonization options relying on a mix of vehicle technologies and travel demand management can better meet the diverse needs of the region's populations. Thus, the combined approaches offer a preview of what a decarbonized transportation future might look like in the COG jurisdictions.

For the analyses of combined strategies, the scenarios were layered to account for changes in VMT from the MSTB strategies (MS scenarios) combined with changes in vehicle emissions factors from the vehicle technology

[35] DeMeester, Lois R., Lama Bou Mjahed, Tasha Arreza, and Natalie Covill. "Arlington County Shared Mobility Devices (SMD) Pilot Evaluation Report," September 2019. https://1105am3mju9f3st1xn20q6ek-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/ARL_SMD_Evaluation-Final-Report-1112-vff-2.pdf.

[36] CDM Smith. "CAV Traffic Simulation Literature Review." Ohio Department of Transportation, November 9, 2019. https://transportation.ohio.gov/static/Programs/StatewidePlanning/Modeling-Forecasting/CAVTrafficSimulationLitReview.pdf

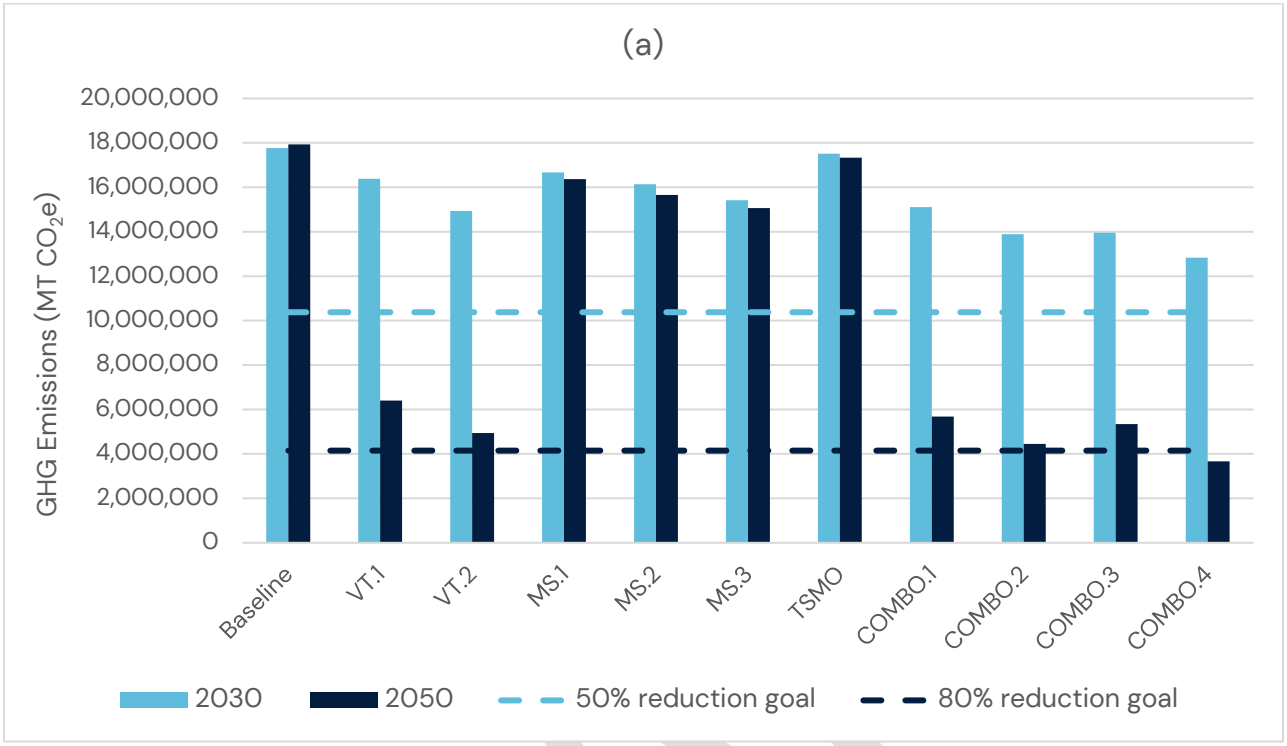
and fuels strategies (VT scenarios), and by changes in vehicle operations (TSMO scenario) for internal combustion engine vehicles. For the COMBO.4 scenario, ICF assumed additional shared use of CAVs by adjusting downward VMT based on assumptions about the penetration and uptake of shared and connected vehicles and shifting a portion of single-occupant vehicle (SOV) travel to shared modes.

4 Scenario Analysis Findings

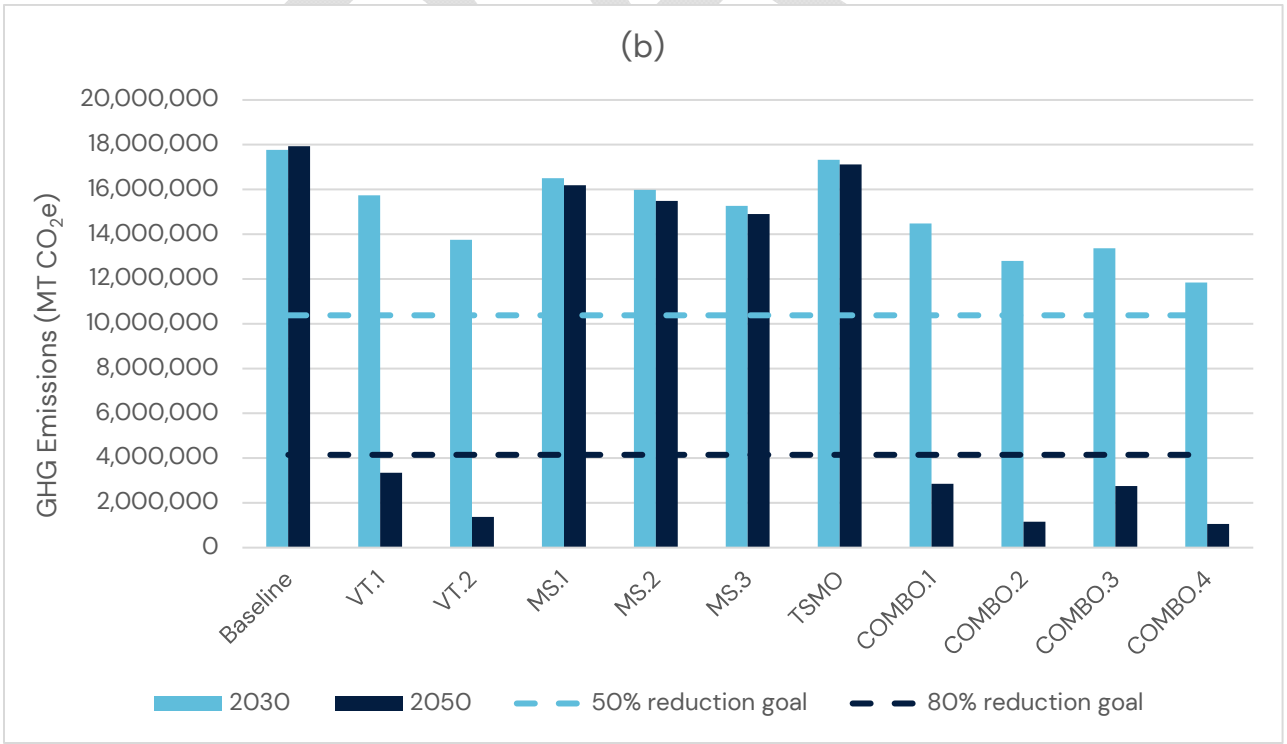
Overall Summary

The results of the scenario analysis conducted under the Reference Electric Grid Case are shown in Figure 10a. The results of the scenario analysis conducted under the Clean Electric Grid Case are shown in Figure 10b. As expected, the COMBO scenarios are more effective than the individual ones simulated in this study; however, none of the simulated scenarios meet the 2030 goals set by COG for reducing GHG emissions to 50% below 2005 levels (see Figure 10a and Figure 10b). The GHG emission reduction across all scenarios range from 14% (TSMO) to 38% (COMBO.4) in 2030, suggesting that several aggressive strategies need to be implemented simultaneously to achieve the 2030 goals. However, the analysis also shows that individual scenario VT.2 could provide the same GHG emission reductions as the COMBO.1 by 2030 (28% and 27%, respectively), providing COG with two different implementation pathways to reach a similar target. In 2050, two scenarios – COMBO.2 and COMBO.4 – can, under the Reference Electric Grid Case (Figure 10a), provide COG with the needed GHG emission reductions to reach their goal of 80% GHG reduction below 2005 levels. Among the individual scenarios, VT.2 gets the closest to the 2050 goals by providing a 76% GHG emission reduction. Overall, these results suggest that, in 2050, the effectiveness of the COMBO scenarios is mostly driven by the GHG emission reductions achieved under the individual VT scenarios, while small gains in GHG emission reductions are observed in the MS scenarios from 2030 to 2050. The MS scenarios depend exclusively upon reductions in VMT to realize GHG emissions reductions. Despite aggressive policy assumptions, the MS scenarios do not encourage, under the Reference Electric Grid Case (Figure 10a), enough VMT reduction to meet the 50% or 80% reduction thresholds.

Figure 10. (a) GHG Emissions Estimated for the Transportation Scenarios for the Reference Grid Case (b) GHG Emissions Estimates for the Transportation Scenarios for the Clean Grid Case.



Note: The Reference Grid Case is based on current power sector policies in the District of Columbia, Maryland, and Virginia.



Note: The Clean Grid Case assumes a 100% carbon-free grid by 2035.

Table 4 shows the full result of the simulations performed under the different electric grid scenarios. In a clean grid, which assumes 100% carbon free grid by 2035, the GHG emissions from the VT scenarios are further reduced by an additional 10-15%, improving the effectiveness of strategies relying on vehicle technology and alternative fuels. Note that in the absence of any actions beyond current plans, GHG emissions are forecast to decrease by about 14% in 2030 and by a similar level in 2050 compared to 2005 levels. Table cells are shaded green when the GHG reduction goals (50% in 2030 and 80% in 2050) are attained. Table cells are shaded yellow in cases where the GHG reduction goals were not obtained, but the level of reduction in GHG emissions was high enough that they met the assumed levels needed in the 2030 CEAP to attain the 2030 goal of 50% reduction in GHG emissions across all sectors combined (e.g., transportation, energy production, buildings).

Table 5 demonstrates the same results expressed as **percent reductions from the baseline** level of emissions expected for that year. In this way, the impacts of the scenarios are isolated from existing assumptions about marginal improvements in fuel economy and regional land use.

Table 4. Summary of GHG Reductions Estimated for All Transportation Scenarios Under all Electric Grid Cases (% Reductions from 2005 Level)

Scenario	Key Components	2030			2050		
		Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline	Projects, programs, and plans in the Visualize 2045 plan; base assumptions for vehicle technology; population growth through 2050	-14%	-15%	-15%	-14%	-14%	-15%
VT.1	50% of new LD vehicle sales are EVs in 2030, with 100% by 2040; 30% of new M/HD truck sales are EVs in 2030, with 100% by 2050; 50% of buses on the road are EVs in 2030, 100% in 2050; biofuels/renewable diesel make up 10% of diesel fuel use in 2030 and 20% in 2050	-21%	-21%	-24%	-69%	-75%	-84%
VT.2	100% of new LD vehicle sales are EVs in 2030; 50% of new M/HD truck sales are EVs in 2030, with 100% by 2040; 100% of buses on the road are EVs by 2030; biofuels/renewable diesel make up 20% of diesel fuel use in 2030 and 30% in 2050	-28%	-29%	-34%	-76%	-83%	-93%
MS.1	Land use changes, including new housing in the region; transit fares reduced 50% by 2030 and 75% in 2050; all workplace parking in activity centers priced by 2030; 10% reduction in transit travel time by 2030 and 20% by 2050; 25% telework; increased bike/ped/mobility; reduction in vehicle trips to school	-20%	-20%	-20%	-21%	-21%	-22%
MS.2	MS.1 + DC core cordon pricing + VMT-fees of $0.05 per mile in 2030 and $0.10 per mile in 2050	-22%	-22%	-23%	-25%	-25%	-25%
MS.3	MS.2 with amplified strategies, including free transit; all workplace parking priced by 2050 (not just in activity centers), 15% reduction in transit travel time by 2030 and 30% by 2050; 40% telework	-26%	-26%	-26%	-27%	-28%	-28%
TSMO	Optimized ITS/TSMO, with benefits from connected/automated vehicles (CAVs) by 2050	-16%	-16%	-17%	-16%	-17%	-18%
COMBO.1	Combined scenario: VT.1+ MS.1 + TSMO	-27%	-28%	-30%	-73%	-78%	-86%
COMBO.2	Combined scenario with more aggressive technology emphasis: VT.2 + MS.1 + TSMO	-33%	-34%	-38%	-79%	-85%	-94%
COMBO.3	Combined scenario with more aggressive mode shift emphasis: VT.1 + MS.3 + TSMO	-33%	-33%	-36%	-74%	-79%	-87%
COMBO.4	Combined scenario with aggressive actions across all pathways and shared CAV future: VT.2+MS.3+TSMO+additional sharing	-38%	-39%	-43%	-82%	-87%	-95%

Table 5: Summary of GHG Reductions Estimated for All Transportation Scenarios Under all Electric Grid Cases (% Reductions from Baseline Forecast Level for 2030 and 2050)

Scenario	Key Components	2030			2050		
		Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
VT.1	50% of new LD vehicle sales are EVs in 2030, with 100% by 2040; 30% of new M/HD truck sales are EVs in 2030, with 100% by 2050; 50% of buses on the road are EVs in 2030, 100% in 2050; biofuels/renewable diesel make up 10% of diesel fuel use in 2030 and 20% in 2050	-8%	-8%	-11%	-64%	-71%	-81%
VT.2	100% of new LD vehicle sales are EVs in 2030; 50% of new M/HD truck sales are EVs in 2030, with 100% by 2040; 100% of buses on the road are EVs by 2030; biofuels/renewable diesel make up 20% of diesel fuel use in 2030 and 30% in 2050	-16%	-17%	-23%	-72%	-81%	-92%
MS.1	Land use changes, including new housing in the region; transit fares reduced 50% by 2030 and 75% in 2050; all workplace parking in activity centers priced by 2030; 10% reduction in transit travel time by 2030 and 20% by 2050; 25% telework; increased bike/ped/micromobility	-6%	-6%	-7%	-9%	-9%	-10%
MS.2	MS.1 + DC core cordon pricing + VMT-fees of $0.05 per mile in 2030 and $0.10 per mile in 2050 (analyzed for passenger vehicles)	-9%	-9%	-10%	-13%	-13%	-14%
MS.3	MS.2 with amplified strategies, including free transit; all workplace parking priced by 2050 (not just in activity centers), 15% reduction in transit travel time by 2030 and 30% by 2050; 40% telework	-13%	-13%	-14%	-16%	-16%	-17%
TSMO	Optimized ITS/TSMO, with benefits from connected/automated vehicles (CAVs) by 2050	-1%	-2%	-2%	-3%	-4%	-5%
COMBO.1	Combined scenario: VT.1+ MS.1 + TSMO	-15%	-15%	-19%	-68%	-75%	-84%
COMBO.2	Combined scenario with more aggressive technology emphasis: VT.2 + MS.1 + TSMO	-22%	-23%	-28%	-75%	-83%	-94%
COMBO.3	Combined scenario with more aggressive mode shift emphasis: VT.1 + MS.3 + TSMO	-21%	-22%	-25%	-70%	-76%	-85%
COMBO.4	Combined scenario with aggressive actions across all pathways and shared CAV future: VT.2+MS.3+TSMO+additional sharing in 2050	-28%	-28%	-33%	-80%	-85%	-94%

Note that the change from Baseline Forecast across grids occurs in part due to changes in the baseline EV fleet penetration share and the progressively improving grid emissions rates, and so reflect those benefits in addition to the strategy's effectiveness.

Scenario VT.1: Vehicle Technology and Fuels Scenario

What's Included in the Scenario

The Vehicle Technology and Fuels Improvement Scenario (VT.1) assumed the following:

- **50% of new light-duty passenger car and truck sales are EVs in 2030, ramping up to 100% of new vehicle sales by 2040**: These projections are consistent with President Biden's national goal for new vehicle sales by 2030.[37] Growth in EV sales is assumed to increase linearly over time between asserted sales ratios; however, EV fleet penetration is not linear and depends on the cumulative sales over time.
- **30% of new medium and heavy-duty truck sales are EVs in 2030, ramping up to 100% of new truck sales by 2050**: These projections are consistent with the multi-state Memorandum of Understanding (MOU) [38] signed by Maryland and the District of Columbia committing to achieve at least 30% of all new medium- and heavy-duty vehicle sales to be zero-emission vehicles by 2030, and 100% by 2050 (with sale rates adjusted for different vehicle classes).
- **50% of school and transit buses are EVs in 2030, and 100% are EVs in 2050**: These projections are consistent with a Washington Metropolitan Area Transit Authority (WMATA) plan to move to a fully zero-emission bus fleet by 2045,[39] and with goals set by Montgomery County to transition 300 school buses to electric in the next three years and plans to electrify all 1,422 buses in their fleet by 2035.[40] This scenario assumes that it will take beyond 2030 to get to complete replacement of the bus fleet and deploy the needed EV charging infrastructure.
- **A modest reduction in the carbon intensity of diesel, due to increased use of biodiesel and renewable diesel:** For the VT. 1 scenario, it was assumed that biofuels and renewable diesel would represent 10% of the residual conventional diesel fuel in 2030, and 20% in 2050.

Resulting Fleet Changes

The vehicle sale percentages defined in the VT.1 scenario were incorporated into the VISION model to estimate shares of VMT by vehicle type (e.g., passenger cars, light-duty trucks, etc.) and fuels (including internal combustion engine [ICE], battery electric vehicle [BEV], and plug-in electric vehicles [PHEVs]). Table 6 shows the PHEV and BEV fleet penetration estimates in 2030 and 2050 under the VT.1 scenario. For each vehicle class, the

[37] Ewing, Jack, "President Biden sets a goal of 50 percent electric vehicle sales by 2030." *The New York Times*. August 5, 2021. https://www.nytimes.com/2021/08/05/business/biden-electric-vehicles.html

[38] NESCAUM, "Multi-State Medium and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding." Note that these goals include buses, which are addressed separately here.

[39] WMATA, Zero-Emission Bus Update, website.

[40] Steven Mufson and Kaplan, "Montgomery County School Board Seals Deal to Get 300 of the Buses," *The Washington Post*, February 24, 2021, sec. Climate Solutions, https://www.washingtonpost.com/climate-solutions/2021/02/24/climate-solutions-electric-schoolbuses/.

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residual non-EV fleet (e.g., 74% of passenger vehicles in 2030) is represented by conventional ICE vehicles, diesel or gasoline depending on vehicle type.

Table 6. Percentages of PHEV and BEV by Vehicle Type in 2030 and 2050 in the VT.1 Scenario

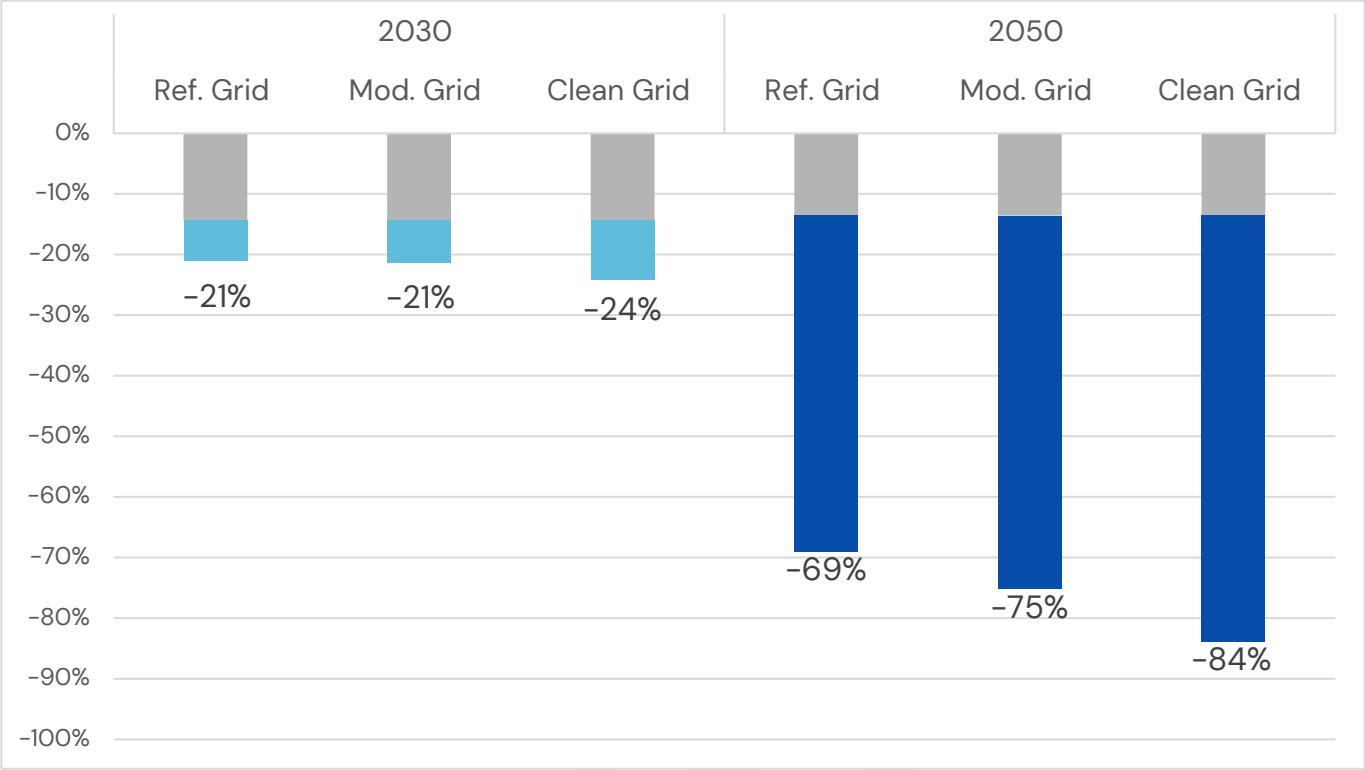
Vehicle Type	2030		2050	
	PHEV	BEV	PHEV	BEV
Light duty Passenger Vehicles	8%	18%	3%	93%
Light duty Passenger Trucks	3%	6%	1%	90%
Medium duty trucks	4%	6%	1%	65%
Heavy duty trucks	0%	3%	0%	47%
Buses	0%	50%	0%	100%

Compared to the 2030 CEAP study, the VT.1 EV fleet penetration percentages in 2030 are slightly lower than the 2030 CEAP High scenario for passenger cars and trucks (the 2030 CEAP High scenario forecasts that 34% of passenger cars and 17% of passenger trucks are EVs in 2030,) and for heavy trucks (the 2030 CEAP High scenario projects that 6% heavy trucks are EVs in 2030). However, the VT.1 scenario assumptions result in higher EV penetration for buses and medium-duty trucks than under the 2030 CEAP (the 2030 CEAP High scenario projects 34% electric transit buses and 7% medium-duty electric trucks in 2030).

GHG Emission Reductions

Figure 11 shows the results of the GHG emission reductions performed for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). The grey bars represent the Baseline Forecast where in absence of any actions beyond current plans, GHG emissions are forecast to decrease by about 14% from the 2005 level in both 2030 and 2050. In the Reference Case, the shift to EVs and biofuels generate sizeable reductions in GHG emissions from motor vehicles in 2030 (about a 21% reduction from the 2005 level) and a very large reduction in 2050 (about a 69% reduction from the 2005 level). With an increasingly cleaner grid, however, the actions taken under the VT.1 scenario yield increasingly larger GHG reductions, going from 21% to 24% in 2030, and from 69% to 84% in 2050. The larger increment in GHG reduction in 2050 compared to what can be obtained in 2030 from the Clean Grid Case is explained by the fact that by 2050, a large share of ICE vehicles has been eliminated and most of the residual GHG emissions come from EV charging. Therefore, changes in the power grid have a large effect on net GHG emissions.

Figure 11. On-Road Transportation GHG Emission Reductions under Scenario VT.1 Compared to 2005



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 7 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the VT.1 scenario under the three different grid cases. The total GHG emission values are the sum of the tailpipe-only and EV-charging related emissions under each grid scenario. While in 2030 EV charging contributes only a small fraction of the total GHG emissions, in 2050 it represents almost 50% of the residual GHG emissions under the Reference Grid scenario, underscoring the importance of decarbonizing both the transportation and the power sector to achieve 2050 goals.

Table 7. GHG Emissions Estimated for 2030 and 2050 under the VT.1 Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
On-road mobile (tailpipe) GHG Emissions ($MMTCO_2e$)	15.57			3.34		
EV-charging GHG Emissions (MMT CO2e)	0.81	0.73	0.16	3.06	1.82	0
Total GHG Emissions (MMT CO_2e)	16.39	16.30	15.74	6.40	5.17	3.34
% GHG reduction (tailpipe) from 2005	-25%			-84%		
% GHG reduction (total) from 2005	-21%	-21%	-24%	-69%	-75%	-84%

*Note: Totals may not match due to rounding.

Table 8 shows the comparison of the VT.1 scenario against the baseline forecast. The implementation of the VT.1 scenario yields 8 to 11% GHG emission reduction compared to the baseline forecast in 2030, but a much larger reduction in 2050 (64 to 81% depending on the grid case) due to a more aggressive substitution of conventional vehicles with EVs.

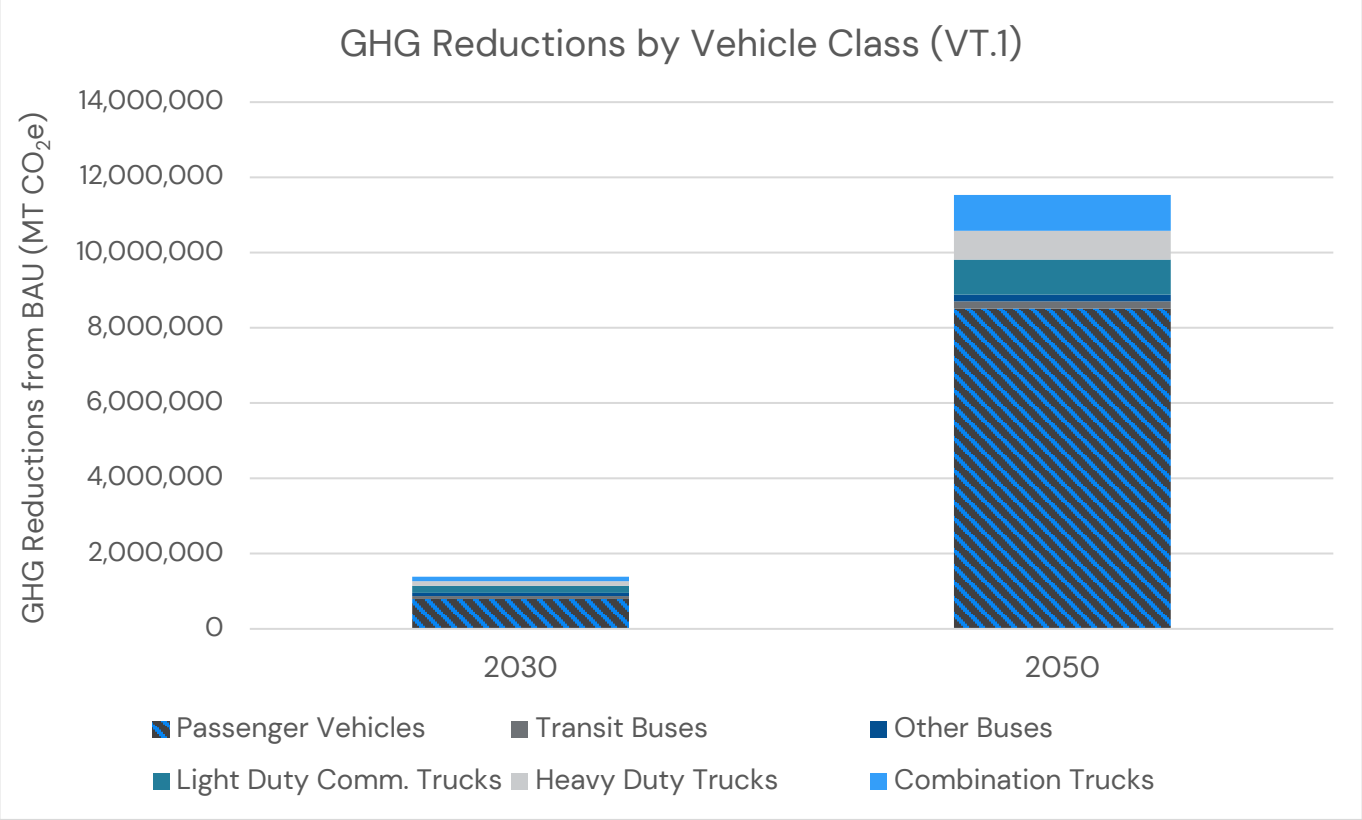
Table 8. Comparison of the VT.1 Scenario GHG Emissions with the 2030 and 2050 Baseline Forecasts

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Reduction Compared to Baseline Forecast (MMT CO_2e)	-1.38	-1.46	-2.03	-11.53	-12.77	-14.59
% Reduction from Baseline Forecast	-8%	-8%	-11%	-64%	-71%	-81%

Finally, Figure 12. shows the breakdown of the GHG emission reductions from the 2030 and 2050 Baseline Forecasts for the different vehicle classes in 2030 and 2050 under the Reference Grid Case (note that these GHG values include the emissions associated with electricity usage from vehicle charging). As shown by the stacked contributions to GHGs, the largest contribution to GHG emission reduction comes from converting passenger vehicles to EVs, both in 2030 and in 2050. This is expected as passenger vehicle electrification dominates GHG reduction because of the large share of total VMT and the more significant shifts toward EVs, particularly in 2050. Combination trucks and light-duty commercial trucks represent the second largest

contribution to GHG reduction in 2050 and 2030, respectively, and result from a combination of electrification and use of biodiesel/renewable diesel.

Figure 12. GHG Emission Reductions from 2030 and 2050 Baseline Forecasts by Vehicle Class in the VT.1 Scenario.



Implementation Considerations

Reaching high level of market penetration for low- and zero-carbon fuels will require implementing a variety of different strategies to address existing and short-term obstacles and challenges. While implementation considerations vary across vehicle types, upfront costs of EVs are probably the biggest concern despite prices expected to continue dropping as more models become commercially available due to industry initiatives and policy forces. (As of November 2021, light-duty EV prices are close to reaching parity with conventional vehicles while medium- and heavy-duty EVs have a much higher upfront cost than their conventional counterparts). On the other hand, payback of EV adoption is expected to be quick as EV ownership generates lifetime savings in fuel and maintenance costs compared to conventional vehicles. Some of the federal, state, and local government interventions that could support the outcomes in the VT scenarios include:

- Continuation and expansion of incentive programs for purchasing EVs, but also other alternative fuels, and fuel-efficient vehicles;
- Vehicle buy-back programs to encourage more expeditious replacement of older vehicles;

- Expansion of public EV-charging infrastructure; the creation of programs to expand access to EV charging in residential buildings, especially multifamily housing, workplaces and commercial and retail, while streamlining permitting processes;
- Leveraging of zoning and land use codes to require the installation of EV-ready charging infrastructure in new residential and commercial buildings; and
- Outreach campaigns aiming at raising awareness around EVs, including outreach to auto dealers and others to promote EV purchases.

Federal or state policies such as carbon pricing and market-based mechanisms such as low-carbon fuel standards could greatly accelerate the deployment of low- and zero emission fuels, including biofuels, by providing a long-term, stable stream of funding for program implementation, thus positively contributing to achieving goals of the metropolitan Washington region. On the other hand, limitations in funding and available equipment could translate to longer implementation timeframes, especially for certain types of heavy-duty vehicles. In those cases, alternatives to low- or zero-carbon alternative fuels such as hybrid electric retrofits would need to be considered. Finally, given the broad scope of the VT scenarios, implementation would also require a high-level of collaborations between various facets of the public and private sectors, including utilities, to create an ecosystem that is favorable to reaching these goals.

Carbon pricing – in the form of a fee on carbon emissions or market-based mechanisms such as cap-and-trade or cap-and-invest programs – has been identified as a potentially promising overarching strategy, but this study did not explicitly analyze carbon pricing. However, carbon pricing may be a mechanism that would help to support other strategies analyzed under this study, such as shifts toward EVs and less-carbon intensive modes of travel. Carbon pricing is viewed by economists as one of the most efficient ways to lower GHG emissions and about 15% of emissions, across more than 80 countries or regions, are currently subject to a carbon price. This is set to grow to over 22%, upon the implementation of scheduled schemes in China, Germany, Virginia and the Mexican state of Tamaulipas.[41] Although carbon pricing is generally viewed as a regressive fee, some jurisdictions have developed ways to make carbon pricing more equitable. For example, in Canada, to compensate for the cost-of-living increase of carbon pricing, the government said it will continue to return most of the money collected by this program through rebates.[42]

Section 5 addresses equity, co-benefits, and cost considerations across all the scenario

[41] "G20 Zero-Carbon Policy Scoreboard," Executive Summary (BloombergNEF, February 2021), https://about.bnef.com/blog/g20-countries-climate-policies-fail-to-make-the-grade-on-paris-promises/.

[42] John Paul Tasker, "Ottawa to Hike Federal Carbon Tax to $170 a Tonne by 2030," Canadian Broadcasting Corporation, December 11, 2020, https://www.cbc.ca/news/politics/carbon-tax-hike-new-climate-plan-1.5837709.

Scenario VT.2: Amplified Vehicle Technology and Fuels Scenario

What's Included in the Scenario

The Amplified Vehicle Technology Improvement (VT.2) Scenario assumed a more rapid shift to EVs and increased use of biofuels. Specifically, the scenario assumed the following:

- **100% of new light-duty passenger car and truck sales are EVs by 2030**: These projections align with a Rocky Mountain Institute study[43] focusing on ways to limit cumulative GHG emissions compatible with 1.5-degree Celsius warming and are more aggressive than the 2021 order by California's Governor for the California Air Resources Board to develop regulations that mandate 100% of new passenger cars and trucks sold in the state to be zero-emission by 2035.[44,45]
- **50% of new medium and heavy-duty truck sales are EVs in 2030, ramping up to 100% of new truck sales by 2040**: These projections are consistent with the California Advanced Clean Trucks (ACT) rules, which would require zero-emission vehicle sales for 55% of the new Class 2b-3 trucks, 75% of new Class 4-8 trucks, and 40% of truck tractors by 2035.[46]
- **100% of transit and school buses are EVs by 2030**: Under this scenario, bus fleet conversion is accelerated more quickly than in the VT.1 scenario.
- **A more substantial increase in use of biofuels:** For the VT.2 scenario, it was assumed that biofuels and renewable diesel would represent 20% of the residual conventional diesel fuel in 2030, and 30% in 2050.

Resulting Fleet Changes

Similar to VT.1, the vehicle sale percentages defined in the VT.2 scenario were incorporated into the VISION model to estimate shares of VMT by vehicle type and fuels. Table 5 shows the PHEV and BEV fleet penetration estimates in 2030 and 2050 under the VT.2 scenario. For each vehicle class, the residual non-EV fleet is represented by conventional ICE vehicles, diesel or gasoline depending on vehicle type. Table 8 of the Technical Memo reports the full set of results from the VISION model.

[43] Energy System Transformation for a 1.5 Degree Celsius Future https://rmi.org/insight/1-5-degree-future/

[44] Office of Governor Gavin Newsom, "Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California's Fight Against Climate Change", September 23, 2020.

[45] The extent to which the overall light-duty fleet is converted to EVs will depend on the rate at which EV sales ramp up. According to the Rocky Mountain Institute Study, 100% of new light-duty vehicle sales at EVs in 2030 would likely equate to about 20% of light-duty vehicles on the road as EVs in 2030 and nearly 100% in 2050. To be consistent with COG's 2030 CEAP, we assume that 34% of light-duty vehicles on the road would be EVs in 2030, which would reflect a significantly higher level of vehicle turn-over than under typical conditions. This assumption seems very aggressive but is not as aggressive as the Montgomery County Climate Action Plan, which assumes 100% electrification of transportation options by 2035.

[46] California Air Resources Board, Advanced Clean Trucks Fact Sheet, June 25, 2020.

Table 9. Percentages of PHEV and BEV by Vehicle Type in 2030 and 2050 in the VT.2 Scenario

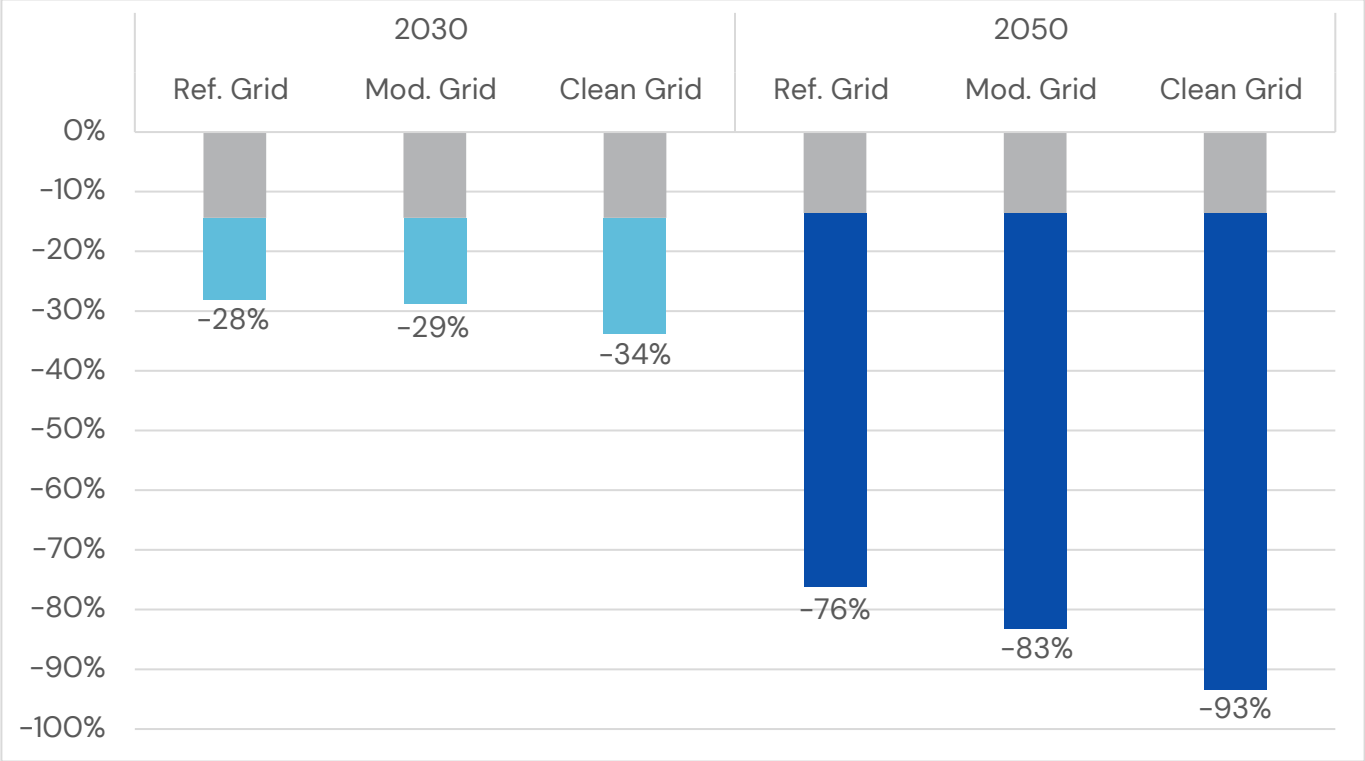
Vehicle Type	2030		2050	
	PHEV	BEV	PHEV	BEV
Light duty Passenger Vehicles	11%	25%	4%	96%
Light duty Passenger Trucks	8%	19%	3%	95%
Medium duty trucks	0%	14%	0%	85%
Heavy duty trucks	0%	5%	0%	76%
Buses	0%	100%	0%	100%

Compared to the previous 2030 CEAP study, the VT.2 EV + PHEV fleet penetration percentages in 2030 are higher than the 2030 CEAP High scenario for passenger cars and trucks (the 2030 CEAP High scenario projects that 34% passenger cars and 17% passenger trucks are EVs in 2030, compared to 36% and 27% BEV+PHEV estimated from the VT.2, respectively), but lower for heavy trucks (the 2030 CEAP High scenario projects that 6% heavy trucks are EVs in 2030 compared to 5% under VT.2). The VT.2 scenario assumptions result in higher EV penetration for buses and medium-duty trucks than under the 2030 CEAP (the 2030 CEAP High scenario projects 34% electric transit buses and 7% medium-duty electric trucks in 2030 compared to 100% and 14% under the VT.2 assumptions).

GHG Emission Reductions

Figure 13 shows the results of the GHG emission reductions performed for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). The grey bars represent the Baseline Forecast where in absence of any actions beyond current plans, GHG emissions are forecast to decrease by about 14% from the 2005 level in both 2030 and 2050. In the Reference Case, the shift to EVs and biofuels generate sizeable reductions in GHG emissions from motor vehicles in 2030 (about a 28% reduction from the 2005 level) and a very large reduction in 2050 (about a 76% reduction from the 2005 level). Similar to what observed for VT.1, under the Clean Grid, the actions taken under the VT.2 scenario yield increasingly larger GHG reductions, going from 28% to 34% in 2030, and from 76% to 93% in 2050. Effectively, substituting more than 90% of the ICE vehicles with alternative fuels in 2050 and running the grid on clean energy yields to a near-complete elimination of GHG emissions from the transportation sector in the COG region.

Figure 13. GHG Emission Reductions under VT.2 for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case)



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 10 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the VT.2 scenario under the three different grid cases. The total GHG emission values are the sum of the tailpipe-only and EV-charging related emissions under each grid scenario. For both total GHG emissions and percentage reductions, separate values are reported for tailpipe only (that is, GHG emissions only associated with tailpipes) and electricity (that is, emission associated with electricity consumption for EV charging). In 2030, the GHG emissions under the VT.2 scenario are still dominated by tailpipes, while in 2050 most of the tailpipe emissions have been eliminated and electricity generation represents 70% to 100% of the residual GHG emissions resulting from the implementation of the VT.2 scenario.

Table 10. GHG Emissions Estimated for 2030 and 2050 under the VT.2 Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
On-road mobile (tailpipe) GHG Emissions ($MMTCO_2e$)	13.45			1.37		
EV-charging GHG Emissions (MMT CO2e)	1.48	1.33	0.30	3.57	2.12	0
Total GHG Emissions (MMT CO_2e)	14.93	14.79	13.75	4.94	3.50	1.37
% GHG reduction (tailpipe-only) from 2005	-35%			-93%		
% GHG reduction (total) from 2005	-28%	-29%	-34%	-76%	-83%	-93%

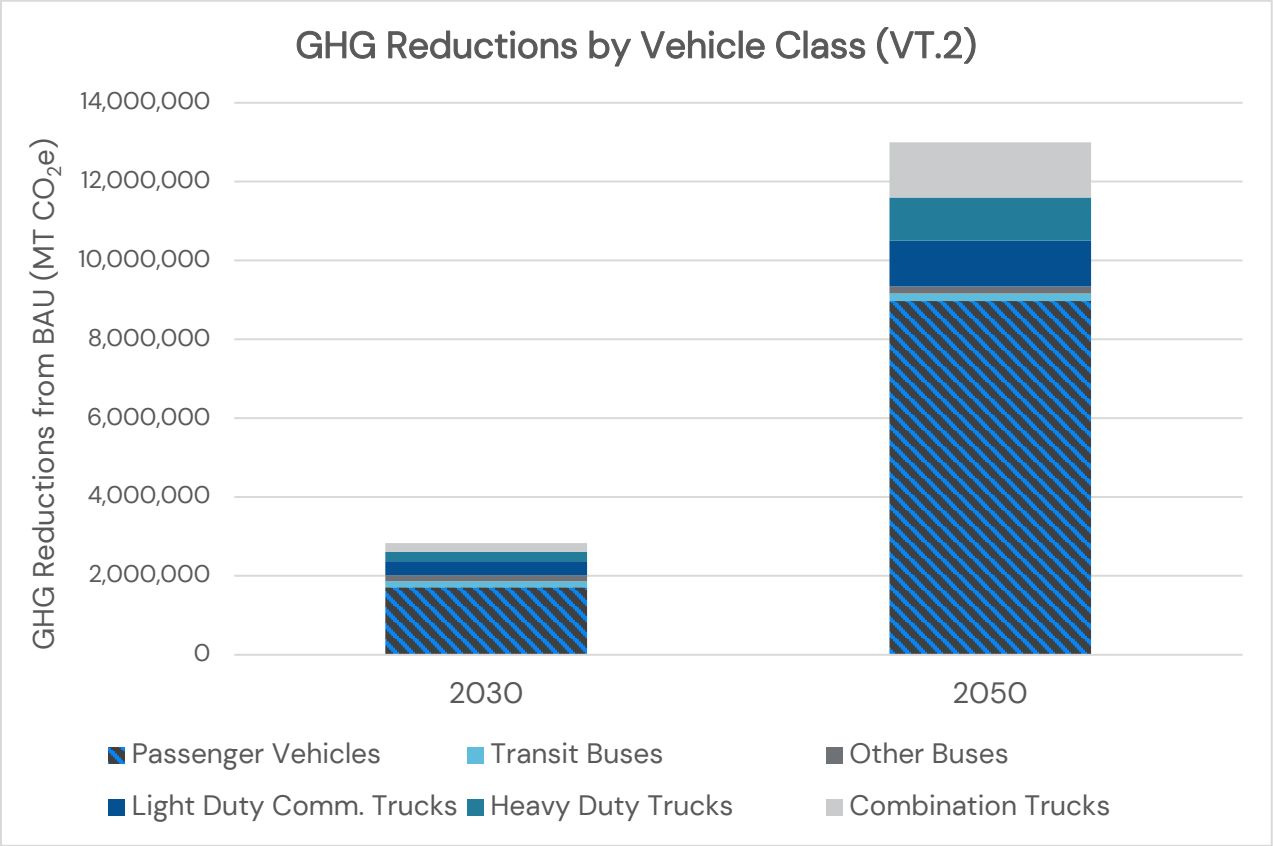
Table 11 shows the comparison of the VT.2 scenario against the baseline forecast. The implementation of the VT.2 scenario yields 16 to 23% GHG emission reduction compared to the baseline forecast in 2030, but a much larger reduction in 2050 (72 to 92% depending on the grid case) due to a more aggressive substitution of conventional vehicles with EVs.

Table 11. Comparison of the VT.1 Scenario GHG Emissions with the 2030 and 2050 Baseline Forecasts

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Reduction Compared to Baseline Forecast (MMT CO_2e)	-2.83	-2.98	-4.02	-12.99	-14.44	-16.56
% Reduction from Baseline Forecast	-16%	-17%	-23%	-72%	-81%	-92%

Finally, Figure 14 shows the breakdown of the GHG emission reductions from the Baseline Forecast for the different vehicle classes in 2030 and 2050 under the Reference Grid Case (note that these GHG values include the emissions associated with electricity usage from vehicle charging). Similar to VT.1, the largest contribution to GHG emission reduction comes from converting passenger vehicles to EVs, both in 2030 and in 2050. However, combination trucks and light-duty commercial trucks have a larger contribution to GHG reduction in 2050 compared to VT.1, as a result of a more aggressive implementation of vehicle electrification and use of biodiesel/renewable diesel for the residual diesel-powered vehicles.

Figure 14. GHG Emission Reductions by Vehicle Class in the VT.2 Scenario.



Implementation Considerations

Implementation policies, incentives, and programs for the VT.2 scenario would be similar to those under VT.1 but require even faster implementation of shifts to EVs and biofuels. The even faster adoption of technologies and low-carbon fuels would presumably need to be advanced in part with federal support, such as more stringent fuel economy standards, incentives, and EV charging infrastructure, as well as state and regional initiatives.

Scenario MS.1: Mode Shift and Travel Behavior Scenario

What's Included in the Scenario

The Mode Shift (MS.1) Scenario relied heavily on the MSTB strategies included in past COG and TPB studies including the MSWG, LRPTF, and 2030 CEAP, and assumed the following:

- **Land use changes**: Land use changes were assumed so that incremental growth after 2025 (for 2030 and 2050) outside of Activity Centers is shifted to Activity Centers and areas with high-capacity transit stations, with a focus on improving jobs-housing balance both within a jurisdiction and across jurisdictions, similar to the LRPTF aspirational land use initiative.[47] In addition, it was assumed that 77,000 new households would be added to the region in 2030 and 126,000 new households in 2050 to increase jobs-housing balance and support a reduction in long-distance commute trips. This analysis relied largely upon the previous LRPTF assumptions/results, for modeling, as well as additional assumptions about mode shift to bicycle/ped/micro-mobility for short trips.
- **Transit fare reductions**: Transit fares reduced 50% by 2030 and 75% by 2050. This assumption is more aggressive than what was analyzed in the MSWG where transit fares were reduced regionally by 25% in 2040 and 40% in 2050. These fare reductions could be in the form of overall system-wide price reductions and/or subsidies provided by employers.
- **Travel demand management strategies**: 25% telework assumption on an average day (equates to about 50% telework for "office" employees, who make up about half of the workforce; this could be in the form of a hybrid work arrangement where employees on average work from home 2-3 days per week); all workplace parking in Activity Centers is priced by 2030. This assumption is more aggressive than assumptions in the MSWG and LRPTF studies. Parking prices were assumed to range between $6 per day in non-Activity Centers to $14 per day in the downtown DC Core. The analysis accounted for the existing share of employees that pay for parking, based on data on the percent of employees receiving free parking in different parts of the region in the region's State of the Commute Survey for 2019. It also accounted for the existing share of employees teleworking or on a compressed work week schedule (estimated at 9.7% working from home or on a day off due to compressed work weeks) based on the State of the Commute Survey for 2019.
- **Transit enhancements**: Enhancements generally equating to a reduction of transit travel times by about 10% by 2030 and 20% by 2050 (due to increased transit frequencies, improved transfer connections, and expanded bus rapid transit (BRT) networks), throughout the region.
- **Bicycle/pedestrian/micro-mobility enhancements**: Increased active transportation infrastructure leads to micromobility system uptake throughout the entire region by 2030 based on uptake levels seen in Arlington County, VA. This uptake level doubles by 2050.

[47] Note: this analysis will be conducted for 2045 using the COG's Cooperative Land Use Forecast and scaled to 2050.

Transportation System Impacts

The combination of strategies in the MS.1 scenario is estimated to reduce passenger VMT (in passenger cars and light-duty trucks) by approximately 10% in 2030 and by about 13% in 2050, compared to the baseline forecast, as shown in Table 12 below. The scenario also results in small reduction in commercial truck VMT due to land use modifications only. The analysis assumes no change in vehicle travel by other vehicles classes, such as buses or heavy-duty freight trucks, since the MSTB strategies focus on efforts to encourage people to drive less, largely through mode shifts to transit, ridesharing, bicycling, and walking; through reduced vehicle trip lengths by bringing jobs and housing closer together; and by replacing some vehicle trips through telework.

Table 12. Estimated Change in Passenger VMT from MS.1 Strategies

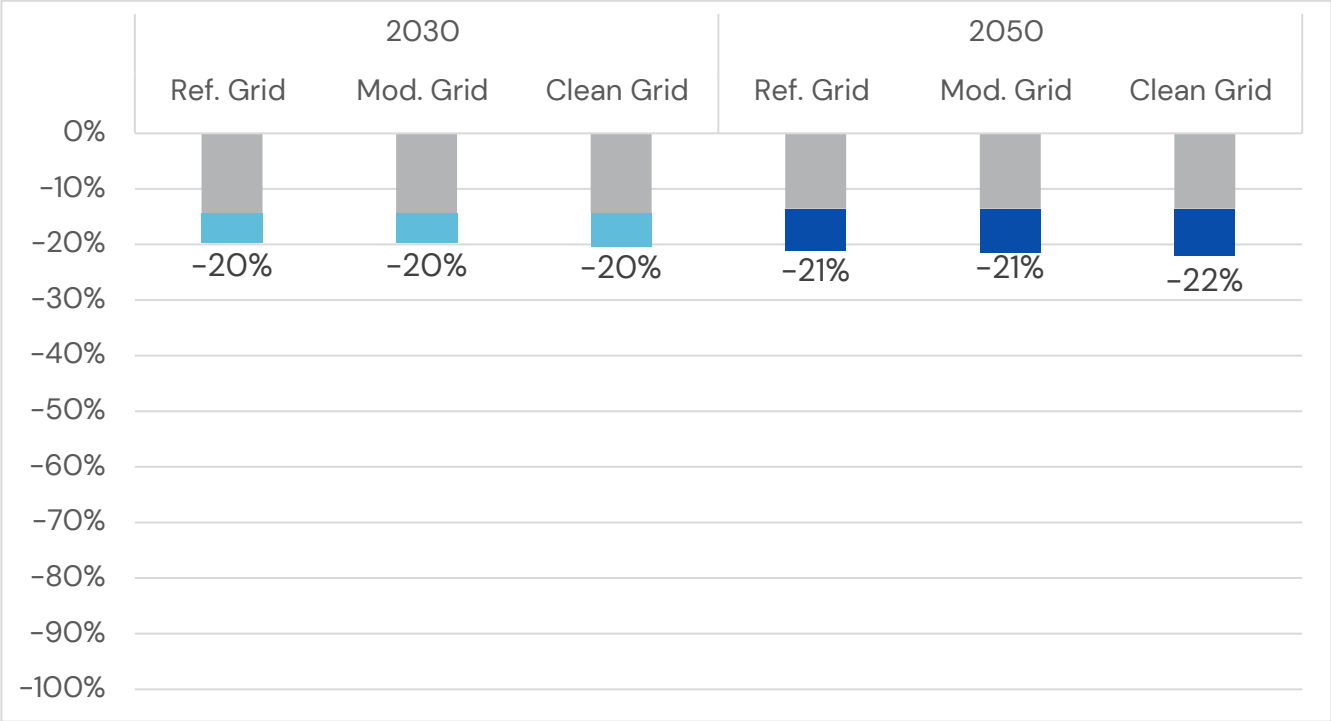
	2005	2018	2030 Baseline Forecast	2030 Under MS.1 Scenario	2050 Baseline Forecast	2050 Under MS.1 Scenario
Passenger car and truck VMT (billions)	35.04	38.11	42.23	38.20	47.01	40.74
% Reduction from baseline forecast				-10%		-13%

It is worth noting that some of the strategies under MS.1 focus on work trips, such as by increasing telework and increasing the application of parking pricing at worksites, while others - such as land use changes, transit fare reductions, transit enhancements, and bicycle/pedestrian/micro-mobility enhancements - have impacts on reducing vehicle travel for both work and non-work trips.

GHG Reductions Estimated

Figure 15 shows the estimated GHG emission reductions for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). This scenario is estimated to result in on-road transportation GHG emissions that are 20% below the 2005 level in 2030, and about 21-22% below the 2005 level in 2050, depending on the grid assumptions. In this case, changes in the electric grid have a relatively small impact on overall emissions, since a small share of vehicles are assumed to be EVs. The level of emissions reduced off the baseline forecast grows over time as strategies such as land use policies have more effect over time.,

Figure 15. On-Road Transportation GHG Emission Reductions under Scenario MS.1 Compared to 2005



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 13 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the MS.1 scenario under the three different grid cases, and Table 14 shows the estimated GHG emissions reduced in comparison the baseline forecast for each year. Under the reference case grid and compared to baseline emissions, the MS.1 scenario strategies are estimated to reduce on-road transportation emissions (including those from tailpipe/evaporative and electricity) by about 6% in 2030 and by about 9% in 2050, as the impacts of land use strategies, transit enhancements, and transit price reductions increases.

Table 13. GHG Emissions Estimated for 2030 and 2050 under the MS.1 Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
On-Road Mobile (tailpipe) GHG Emissions ($MMTCO_2e$)	16.46			16.19		
Electricity GHG Emissions from On-Road Vehicles (MMT CO2e)	0.21	0.19	0.04	0.18	0.11	0
Total On-Road Related GHG Emissions (MMT CO_2e)	16.67	16.65	16.50	16.37	16.30	16.19
% Reduction (tailpipe) from 2005	-21%			-22%		
% Reduction total from 2005	-20%	-20%	-20%	-21%	-21%	-22%

Table 14. GHG Emissions Estimated for 2030 and 2050 under the MS.1 Scenario Compared to Baseline Forecast

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline On-Road Related GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Change Compared to Baseline (MMT CO_2e)	-1.10	-1.12	-1.27	-1.56	-1.64	-1.75
% Change from Baseline Forecast	-6%	-6%	-7%	-9%	-9%	-10%

Note: The change in % Change from Baseline Forecast across grids occurs due to the baseline EV fleet penetration share and the progressively improving grid emissions rates, and not due to changes in the strategy's effectiveness. This analysis did not account for the GHG benefits of improvements in traffic flow, which could result in a modest additional benefit.

Note that in addition to reducing travel-related emissions, this scenario may have implications – positive or negative – on emissions from other sectors. Specifically, the addition of new households to the region may increase residential energy consumption, although the per household residential energy consumption of multi-family is typically reduced compared to single-family homes. The shift to remote work may allow some organizations to maintain smaller office spaces or completely eliminate offices, reducing building-related emissions. It is worth noting, however, that shifts to teleworking may increase energy consumption at home offices, as office buildings often maintain a similar level of heating/cooling even when capacity is significantly reduced.[48] There also may be secondary effects, such as some shifts of jobs between different parts of the region, particularly in reducing restaurant, retail, or other jobs in downtown areas that are dependent on worker populations.

Implementation Considerations

The strategies within this scenario are all highly interrelated, as enhancements in land use, transit, and active transportation investments can be integrated into a unified approach. A network-wide approach to enhancing transit, bicycle and pedestrian, and other modal alternatives is often viewed as having synergistic effects.

While land use can be influenced by a variety of regulatory and non-regulatory approaches, including zoning, bonus densities for development in transit-oriented locations, and incentives, market forces play a role, and it would likely take considerable regional coordination to yield the changes in development patterns and increases in housing assumed in the scenario.

[48] O'Brien, William and Fereshteh Yazdani Aliabadi. "Does telecommuting save energy? A critical review of quantitative studies and their research methods." July 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7369595/

Transit enhancements could include a wide variety of efforts including increases in bus rapid transit networks, transit signal priority, Metrorail core capacity, Metrorail or light-rail extensions, increased frequency of transit services, or transit reliability enhancements. Meanwhile, bicycle/pedestrian/micromobility enhancements could include development of additional non-motorized (on-road or off-road) networks, increased deployment of dockless or docked bicycle, e-bikes, or scooters; roadway traffic calming and safety enhancements, additions of sidewalks; and other strategies.

Many of these initiatives particularly related to transit may require considerable investments of resources, not only for development of new infrastructure but also operations of new services. Meanwhile, transit fare reductions would reduce farebox revenue. Consequently, potentially large amounts of additional funding would likely be required to implement components of this scenario. Mandating that employers charge for parking for employees or provide for telework may not be feasible and may need to be implemented through voluntary programs, incentives, or employer trip reduction ordinances.

Scenario MS.2: Mode Shift and Travel Behavior Scenario + Road Pricing

What's Included in the Scenario

This scenario extends upon the same strategies listed above but applies the following road pricing policies:

- VMT Fee: $0.05 per mile in 2030 and $0.10 per mile in 2050
- DC Core Cordon Tax: $10 per entry into downtown 2030 and continuing through 2050

Note that the prices are in relation to "current" year prices for general driving operating costs, parking, etc. and would be expected to be higher in the year of implementation based on inflation and other factors affecting general costs. This analysis of VMT fees focuses on those designed to support a reduction in driving as opposed to replacing existing fuel tax charges; the fees are modeled to implicitly assume these fees are an increase in the cost of driving. If mileage-based usage fees are implemented as a substitute for fuel taxes, these fees would be essentially on top of the fees that are replacing fuel taxes.

Transportation System Impacts

The combination of strategies in the MS.2 scenario is estimated to reduce passenger VMT (in passenger cars and light-duty trucks) by approximately 14% in 2030 and by about 20% in 2050, compared to the baseline forecast, as shown in Table 15 below. The scenario also results in small reduction in commercial truck VMT due to land use modifications only. The analysis assumes no change in vehicle travel by other vehicles classes, such as buses or heavy-duty freight trucks, since the MSTB strategies focus on efforts to encourage people to drive less, largely through mode shifts to transit, ridesharing, bicycling, and walking; through reduced vehicle trip lengths by bringing jobs and housing closer together; and by replacing some vehicle trips through telework.

Table 15. Estimated Change in Passenger VMT from MS.2 Strategies

	2005	2018	2030 Baseline Forecast	2030 Under MS.2 Scenario	2050 Baseline Forecast	2050 Under MS.2 Scenario
Passenger car and truck VMT (billions)	35.04	38.11	42.23	36.31	47.01	37.83
% Reduction from baseline forecast				-14%		-20%

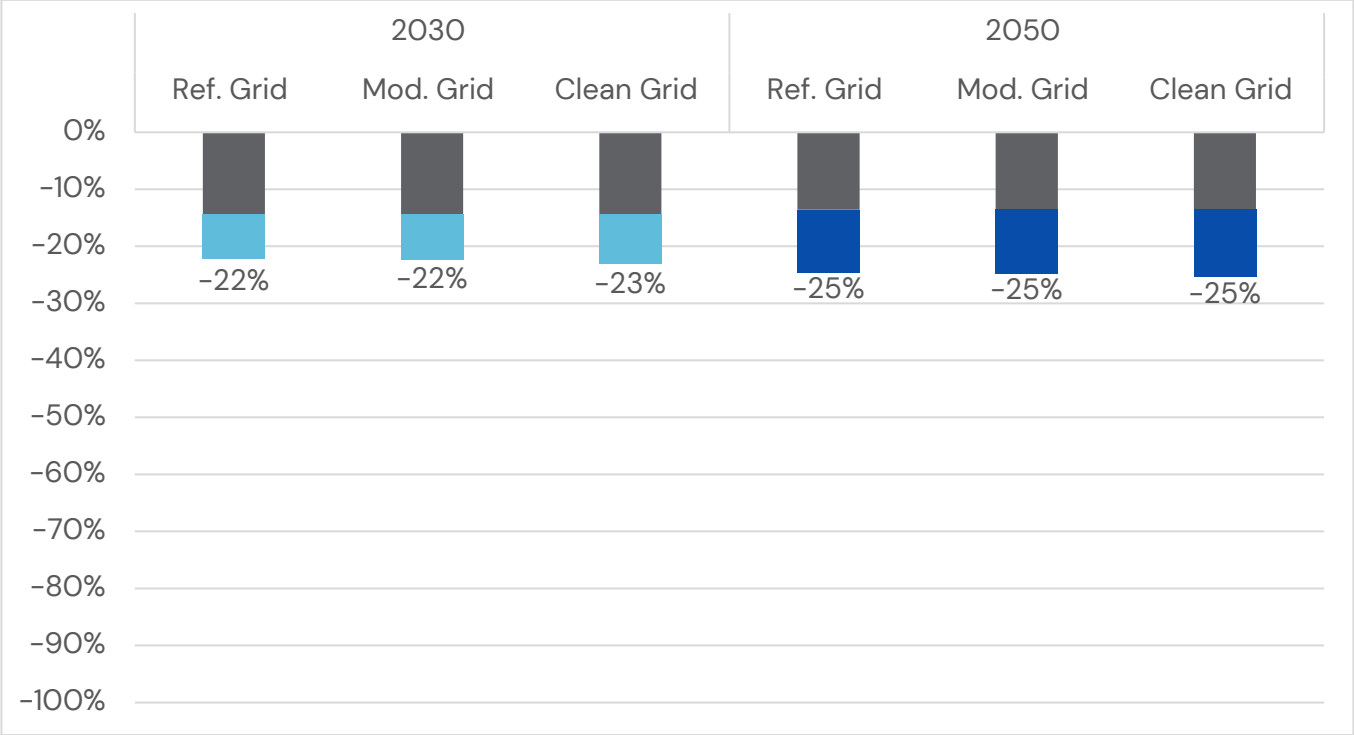
It is worth noting that some of the strategies under MS.2 focus on work trips, such as by increasing telework and increasing the application of parking pricing at worksites, while others - such as land use changes, transit fare reductions, transit enhancements, and bicycle/pedestrian/micro-mobility enhancements - have impacts on reducing vehicle travel for both work and non-work trips.

GHG Reductions Estimated

Figure 16 shows the estimated GHG emission reductions for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). This scenario is estimated to result in on-road transportation GHG emissions that are 22-23% below the 2005 level in 2030, and about 25% below the 2005 level in 2050,

depending on the grid assumptions. In this case, changes in the electric grid have a relatively small impact on overall emissions, since a small share of vehicles are assumed to be EVs. The level of emissions reduced off the baseline forecast grows over time as strategies such as land use policies have more effect over time.

Figure 16. On-Road Transportation GHG Emission Reductions under Scenario MS.2 Compared to 2005



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 16 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the MS.2 scenario under the three different grid cases, and Table 17 shows the estimated GHG emissions reduced in comparison the baseline forecast for each year. Under the reference case grid and compared to baseline emissions, the MS.2 scenario strategies are estimated to reduce on-road transportation emissions (including those from tailpipe/evaporative and electricity) by about 9% in 2030 and by about 13% in 2050, as the impacts of land use strategies, transit enhancements, and transit price reductions increases.

Table 16. GHG Emissions Estimated for 2030 and 2050 under the MS.2 Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
On-Road Mobile (tailpipe) GHG Emissions ($MMTCO_2e$)	15.94			15.48		
Electricity GHG Emissions from On-Road Vehicles (MMT CO2e)	0.20	0.18	0.04	0.17	0.10	0
Total On-Road Related GHG Emissions (MMT CO_2e)	16.14	16.12	15.98	15.66	15.59	15.48
% Reduction (tailpipe) from 2005	-23%			-25%		
% Reduction total from 2005	-22%	-22%	-23%	-25%	-25%	-25%

Table 17. GHG Emissions Estimated for 2030 and 2050 under the MS.2 Scenario Compared to Baseline Forecast

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline On-Road Related GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Change Compared to Baseline (MMT CO_2e)	-1.63	-1.65	-1.79	-2.28	-2.35	-2.45
% Change from Baseline Forecast	-9%	-9%	-10%	-13%	-13%	-14%

Note: The change in % Change from Baseline Forecast across grids occurs due to the baseline EV fleet penetration share and the progressively improving grid emissions rates, and not due to changes in the strategy's effectiveness

Note that in addition to reducing travel-related emissions, this scenario may have implications – positive or negative – on emissions from other sectors. Specifically, the addition of new households to the region may increase residential energy consumption, although the per household residential energy consumption of multi-family is typically reduced compared to single-family homes. The shift to remote work may allow some organizations to maintain smaller office spaces or completely eliminate offices, reducing building-related emissions. It is worth noting, however, that shifts to teleworking may increase energy consumption at home offices, as office buildings often maintain a similar level of heating/cooling even when capacity is significantly

reduced.[49] There also may be secondary effects, such as some shifts of jobs between different parts of the region, particularly in reducing restaurant, retail, or other jobs in downtown areas that are dependent on worker populations.

Implementation Considerations

In addition to the considerations in MS.1, a cordon pricing program is implemented for the downtown DC core. This policy affects only a portion of regional VMT.

Concurrently, a VMT fee is introduced which affects all vehicle trips throughout the region. When designing a VMT fee, considerations should include the tax base (which vehicle types would be affected); the fee rate structure (whether the fee would vary based on vehicle specifications, location, and/or time of travel); and implementation methods (odometers, radio-frequency identification readers, or onboard devices).[50] With VMT fees, states must also determine whether all drivers pay or if there are exemptions for electric vehicles. A VMT fee that applies to all vehicle types would not help incentivize a transition to lower-carbon vehicles (compared to a carbon tax or other carbon pricing policies).

[49] O'Brien, William and Fereshteh Yazdani Aliabadi. "Does telecommuting save energy? A critical review of quantitative studies and their research methods." July 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7369595/

[50] Congress of the U.S. Congressional Budget Office. "Issues and Options for a Tax on Vehicle Miles Traveled by Commercial Trucks." 2019. https://www.cbo.gov/system/files/2019-10/55688-CBO-VMT-Tax.pdf

Scenario MS.3: Amplified Mode Shift and Travel Behavior Scenario + Road Pricing

What's Included in the Scenario

This scenario extends the strategies in MS.2 and is more aggressive in application:

- **Free transit**.
- **Travel demand management strategies**: About 40% telework assumption (equates to about 80% telework for "office" employees on an average day, or just coming into office 1 day per week on average under a hybrid work arrangement); all worksite parking in all locations (not just Activity Centers) is priced by 2050.
- **Transit enhancements**: Enhancements generally equating to a reduction of transit travel times by 15% by 2030 and 30% by 2050, reflecting even more extensive implementation of BRT and other transit enhancement strategies.

This scenario maintains the same road charge averaging of $0.05 per mile in 2030 and $0.10 per mile in 2050 (in comparison to current year prices), and an estimated cordon price for downtown DC of $10 per trip by 2030, continuing beyond.

Transportation System Impacts

The combination of strategies in the MS.3 scenario is estimated to reduce passenger VMT (in passenger cars and light-duty trucks) by approximately 20% in 2030 and by about 25% in 2050, compared to the baseline forecast, as shown in Table 12 below. The scenario also results in small reduction in commercial truck VMT due to land use modifications only. The analysis assumes no change in vehicle travel by other vehicles classes, such as buses or heavy-duty freight trucks, since the MSTB strategies focus on efforts to encourage people to drive less, largely through mode shifts to transit, ridesharing, bicycling, and walking; through reduced vehicle trip lengths by bringing jobs and housing closer together; and by replacing some vehicle trips through telework.

Table 18. Estimated Change in Passenger VMT from MS.3 Strategies

	2005	2018	2030 Baseline Forecast	2030 Under MS.3 Scenario	2050 Baseline Forecast	2050 Under MS.3 Scenario
Passenger car and truck VMT (billions)	35.04	38.11	42.23	33.73	47.01	35.37
% Reduction from baseline forecast				-20%		-25%

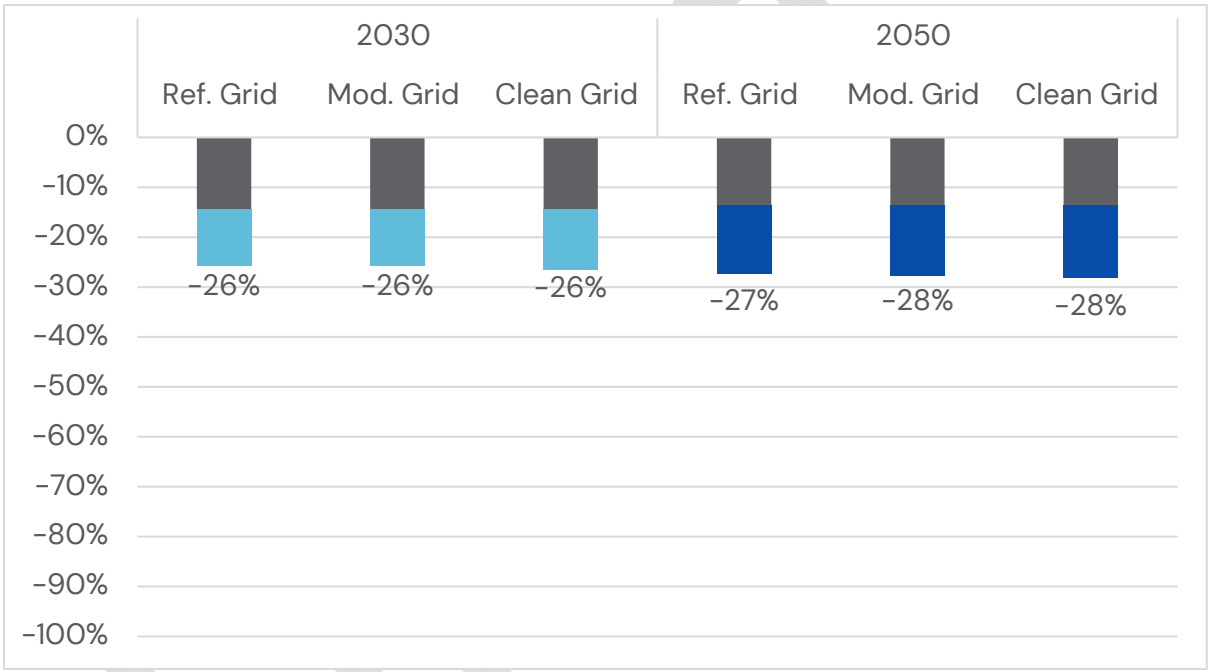
It is worth noting that some of the strategies under MS.3 focus on work trips, such as by increasing telework and increasing the application of parking pricing at worksites, while others - such as land use changes, transit fare

reductions, transit enhancements, and bicycle/pedestrian/micro-mobility enhancements - have impacts on reducing vehicle travel for both work and non-work trips.

GHG Reductions Estimated

Figure 17 shows the estimated GHG emission reductions for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). This scenario is estimated to result in on-road transportation GHG emissions that are about 26% below the 2005 level in 2030, and 27-28% below the 2005 level in 2050, depending on the grid assumptions. In this case, changes in the electric grid have a relatively small impact on overall emissions, since a small share of vehicles are assumed to be EVs. The level of emissions reduced off the baseline forecast grows over time as strategies such as land use policies have more effect over time.

Figure 17. On-Road Transportation GHG Emission Reductions under Scenario MS.3 Compared to 2005



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 19 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the MS.3 scenario under the three different grid cases, and Table 19 shows the estimated GHG emissions reduced in comparison the baseline forecast for each year. Under the reference case grid and compared to baseline emissions, the MS.3 scenario strategies are estimated to reduce on-road transportation emissions (including those from tailpipe/evaporative and electricity) by about 13% in 2030 and by about 16% in 2050, as the impacts of land use strategies, transit enhancements, and transit price reductions increases.

Table 19. GHG Emissions Estimated for 2030 and 2050 under the MS.3 Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
On-Road Mobile (tailpipe) GHG Emissions ($MMTCO_2e$)	15.23			14.90		
Electricity GHG Emissions from On-Road Vehicles (MMT CO2e)	0.19	0.17	0.04	0.16	0.10	0
Total On-Road Related GHG Emissions (MMT CO_2e)	15.42	15.40	15.27	15.06	15.00	14.90
% Reduction (tailpipe) from 2005	-27%			-28%		
% Reduction total from 2005	-26%	-26%	-26%	-27%	-28%	-28%

Table 20. GHG Emissions Estimated for 2030 and 2050 under the MS.3 Scenario Compared to Baseline Forecast

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline On-Road Related GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Change Compared to Baseline (MMT CO_2e)	-2.35	-2.37	-2.50	-2.87	-2.94	-3.03
% Change from Baseline Forecast	-13%	-13%	-14%	-16%	-16%	-17%

Note: The change in % Change from Baseline Forecast across grids occurs due to the baseline EV fleet penetration share and the progressively improving grid emissions rates, and not due to changes in the strategy's effectiveness

Note that in addition to reducing travel-related emissions, this scenario may have implications – positive or negative – on emissions from other sectors. Specifically, the addition of new households to the region may increase residential energy consumption, although the per household residential energy consumption of multi-family is typically reduced compared to single-family homes. The shift to remote work may allow some organizations to maintain smaller office spaces or completely eliminate offices, reducing building-related emissions. It is worth noting, however, that shifts to teleworking may increase energy consumption at home offices, as office buildings often maintain a similar level of heating/cooling even when capacity is significantly

reduced.[51] There also may be secondary effects, such as some shifts of jobs between different parts of the region, particularly in reducing restaurant, retail, or other jobs in downtown areas that are dependent on worker populations.

Implementation Considerations

Same considerations as MS.2.

[51] O'Brien, William and Fereshteh Yazdani Aliabadi. "Does telecommuting save energy? A critical review of quantitative studies and their research methods." July 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7369595/

Scenario TSMO: Transportation Systems Management and Operations Scenario

What's Included in the Scenario

This scenario assumes extensive Intelligent Transportation Systems (ITS)/incident management deployment to optimize traffic flow. It also incorporates increased connected/automated vehicles (CAVs) in 2050, assumed to generate fuel economy effects similar to ecodriving. Analysis was based on literature showing effects of ITS and ecodriving on emissions profiles for vehicles, reflecting maximum ecodriving efficiencies to account for CAVs.

Transportation System Impacts

TSMO strategies would build on existing deployments in the region to support improved optimization of traffic flow and transportation system performance through implementation of strategies such as enhanced incident management, traffic signal coordination, and integrated corridor management. The literature suggests that the strategies identified in the TSMO scenario exhibit a wide array of impacts in a variety of regional contexts but generally yield small improvements in overall GHG emissions rates for conventional vehicles. The estimates for this study were based on an FHWA study[52] that simulated several ITS improvements, including ramp metering, incident management, active signal control, and active transportation demand management. The combined effects, even with an increase in VMT, were estimated to reduce regional vehicle GHG emissions by 1.647%, due to the more significant reduction in vehicle hours of travel and delay time. The GHG emissions benefits in the proposed in the TSMO scenario were assumed to only apply to ICE vehicles, as EV and PHEV vehicles would see fewer efficiency improvements due to regenerative braking during periods of congestion.

The benefits for CAVs in 2050 are highly uncertain but were estimated based on studies[53,54] showing that ecodriving generally reduces GHG emissions rates per vehicle by about 2% at minimum. This fuel economy improvement was applied across all vehicle types. While some literature suggests that widescale CAV deployment might increase VMT, there are some who believe that wide-scale adoption could also reduce some VMT by encouraging more shared rides. As a result, this study did not assume an offsetting increase in VMT.

GHG Reductions Estimated

Figure 18 shows the estimated GHG emission reductions for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). This scenario is estimated to result in on-road transportation GHG emissions that are 16-17% below the 2005 level in 2030, and between 16-18% below the 2005 level in 2050,

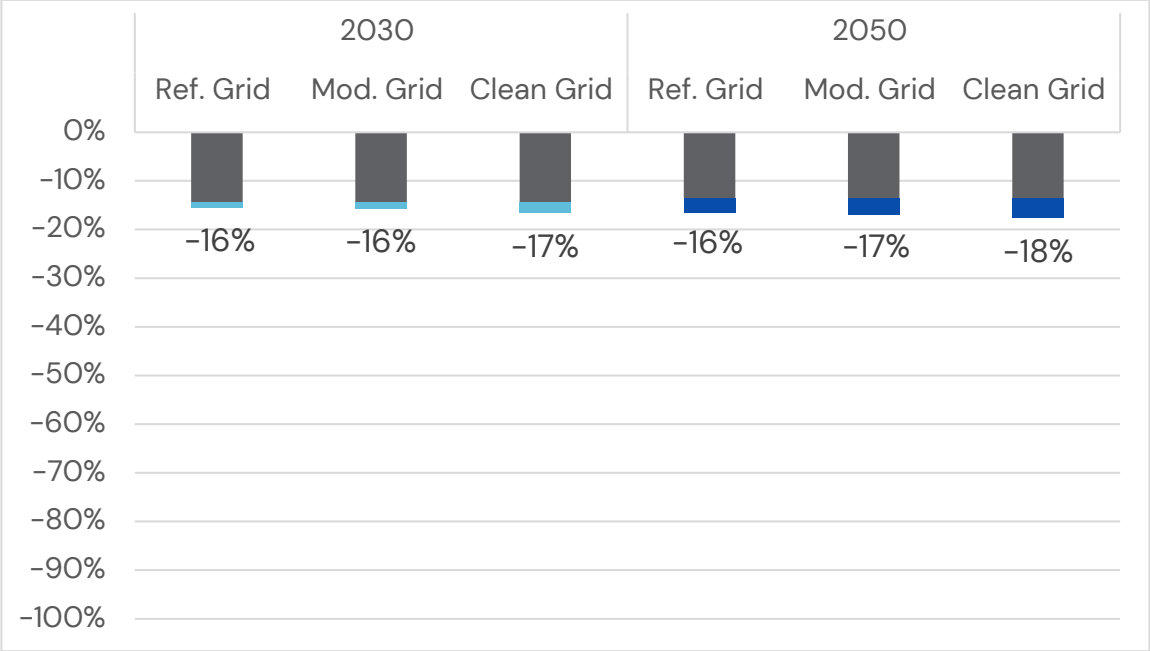
[52] FHWA, "Travel and Emissions Impacts of Highway Operations Strategies," Final Report, dated March 2014, prepared by Cambridge Systematics.

[53] ICF International, "Smart Driving White Paper," prepared for Metropolitan Transportation Commission, October 2014.

[54] Allison, Craig, and Neville Stanton. "Eco-Driving: The Role of Feedback in Reducing Emissions from Everyday Driving Behaviours." Theoretical Issues in Ergonomics Science 20, no. 2 (2019): 85–104. https://doi.org/10.1080/1463922X.2018.1484967.

depending on the grid assumptions. In this case, changes in the electric grid have a relatively small impact on overall emissions, since a small share of vehicles are assumed to be EVs. The level of emissions reduced off the baseline forecast grows slightly over time, as more CAVs with ecodriving behavior come online.

Figure 18. On-Road Transportation GHG Emission Reductions under Scenario TSMO Compared to 2005



Note: The grey portion of the bars indicate GHG emissions reductions occurring in the baseline forecast.

Table 21 summarizes the GHG emission (in MMT CO2e) estimated for 2030 and 2050 from the implementation of the TSMO scenario under the three different grid cases, and Table 22 shows the estimated GHG emissions reduced in comparison the baseline forecast for each year. Under the reference case grid and compared to baseline emissions, the TSMO scenario strategies are estimated to reduce on-road transportation emissions (including those from tailpipe/evaporative and electricity) by about 1% in 2030 and by about 3% in 2050, as the ecodriving benefits of CAVs becomes more pronounced.

Table 21. GHG Emissions Estimated for 2030 and 2050 under the TSMO Scenario Compared to 2005

GHG Emissions Results	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Total On-Road Related GHG Emissions (MMT CO_2e)	17.52	17.49	17.33	17.33	17.25	17.12
% Reduction total from 2005	-16%	-16%	-17%	-16%	-17%	-18%

Table 22. GHG Emissions Estimated for 2030 and 2050 under the TSMO Scenario Compared to Baseline Forecast

Comparison to Baseline Forecast	2030			2050		
	Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline On-Road Related GHG Emissions (MMT CO_2e)	17.77			17.93		
GHG Change Compared to Baseline (MMT CO_2e)	-0.25	-0.27	-0.44	-0.60	-0.69	-0.81
% Change from Baseline Forecast	-1%	-2%	-2%	-3%	-4%	-5%

Note: The change in % Change from Baseline Forecast across grids occurs due to the baseline EV fleet penetration share and the progressively improving grid emissions rates, and not due to changes in the strategy's effectiveness

Implementation Considerations

The effectiveness of TSMO strategies at reducing GHG reductions could decline over time as the fleet transitions to hybrid and electric powertrains. This is because speed and flow impact hybrid and electric vehicles differently from ICE vehicles. Hybrid and electric vehicles can recapture some energy lost when braking during congested conditions using regenerative braking, whereas ICE vehicles do not have this capability.

COMBO Scenarios (COMBO.1, COMBO.2, COMBO.3, COMBO.4): All Pathways

What's Included in the Scenario

These scenarios combine the strategies from several scenarios, yielding reductions in both emissions rates and VMT. The combinations consist of the following scenario mixes:

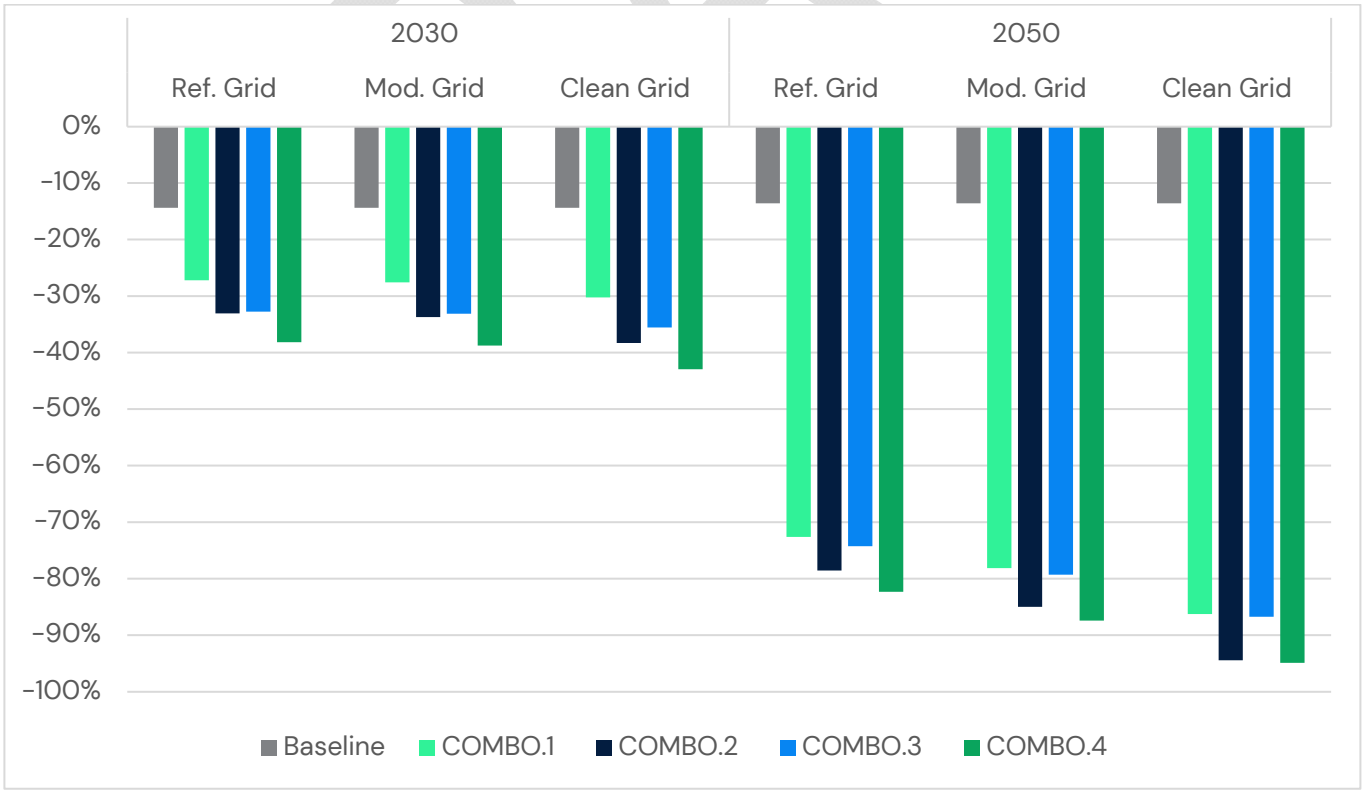
- COMBO.1: All Pathways (VT.1 + MS.1 + TSMO)
- COMBO.2: More Aggressive Technology Emphasis (VT.2 + MS.1 + TSMO)
- COMBO.3: More Aggressive Mode Shift Emphasis (VT.1 + MS.3 + TSMO)
- COMBO.4: Most Aggressive Across All Pathways (VT.2 + MS.3 + TSMO + Shared CAVs)

To simulate a fleet with CAVs, as specified in COMBO.4, all vehicles are assumed to have eco-driving enabled in 2050. Additionally, a share of 2050 SOV vehicle trips and associated VMT are shifted to shared trips, and the affected SOV VMT is reduced proportionally to the projected occupancy rate of these new trips

GHG Reductions Estimated

The emissions reductions benefits of the combination scenarios are shown in Figure 19, and range between a 27-43% reduction in 2030 to a 73-95% reduction in 2050, depending on the electric grid. Combinations provide the largest benefits, particularly in the near-term (2030). By 2050, significant shifts to EVs mean that the power grid is more important in achieving the 80% reduction goal and MSTB strategies become relatively less impactful.

Figure 19. On-Road Transportation GHG Emission Reductions under COMBO Scenarios Compared to 2005



The Table 23 displays the total emissions and the percent reduction compared to 2005 levels. Table 24 displays the difference in emissions and the percent reduction compared to the baseline level.

Table 23. GHG Emissions Estimated for 2030 and 2050 under the COMBO Scenarios Compared to 2005

GHG Emissions Results		2030			2050		
		Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
COMBO.1	Total On-Road Related GHG Emissions (MMT CO_2e)	15.11	15.03	14.48	5.68	4.54	2.85
	% Reduction total from 2005	-27%	-28%	-30%	-73%	-78%	-86%
COMBO.2	Total On-Road Related GHG Emissions (MMT CO_2e)	13.89	13.76	12.8	4.45	3.11	1.16
	% Reduction total from 2005	-33%	-34%	-38%	-79%	-85%	-94%
COMBO.3	Total On-Road Related GHG Emissions (MMT CO_2e)	13.95	13.88	13.37	5.34	4.3	2.75
	% Reduction total from 2005	-33%	-33%	-36%	-74%	-79%	-87%
COMBO.4	Total On-Road Related GHG Emissions (MMT CO_2e)	12.83	12.71	11.84	3.67	2.61	1.06
	% Reduction total from 2005	-38%	-39%	-43%	-82%	-87%	-95%

Table 24. GHG Emissions Estimated for 2030 and 2050 under the COMBO Scenarios Compared to Baseline Forecast

Comparison to Baseline Forecast		2030			2050		
		Ref. Grid	Mod. Grid	Clean Grid	Ref. Grid	Mod. Grid	Clean Grid
Baseline	Baseline On-Road Related GHG Emissions (MMT CO_2e)	17.77			17.93		
COMBO.1	GHG Change Compared to Baseline (MMT CO_2e)	-2.66	-2.74	-3.29	-12.25	-13.4	-15.08
	% Change from Baseline Forecast	-15%	-15%	-19%	-68%	-75%	-84%
COMBO.2	GHG Change Compared to Baseline (MMT CO_2e)	-3.87	-4.01	-4.96	-13.49	-14.82	-16.78
	% Change from Baseline Forecast	-22%	-23%	-28%	-75%	-83%	-94%
COMBO.3	GHG Change Compared to Baseline (MMT CO_2e)	-3.81	-3.88	-4.39	-12.59	-13.64	-15.18
	% Change from Baseline Forecast	-21%	-22%	-25%	-70%	-76%	-85%
COMBO.4	GHG Change Compared to Baseline (MMT CO_2e)	-4.93	-5.06	-5.93	-14.27	-15.32	-16.88
	% Change from Baseline Forecast	-28%	-28%	-33%	-80%	-85%	-94%

Figure 20 through Figure 23 show the results of the GHG emission reductions performed for the three different grid scenarios (Reference Case, Modified Reference Case, and Clean Grid Case). The grey bars represent the Baseline Forecast where in absence of any actions beyond current plans, GHG emissions are forecast to decrease by about 14% from the 2005 level in both 2030 and 2050.

Figure 20. COMBO.1: GHG Reductions Compared to 2005

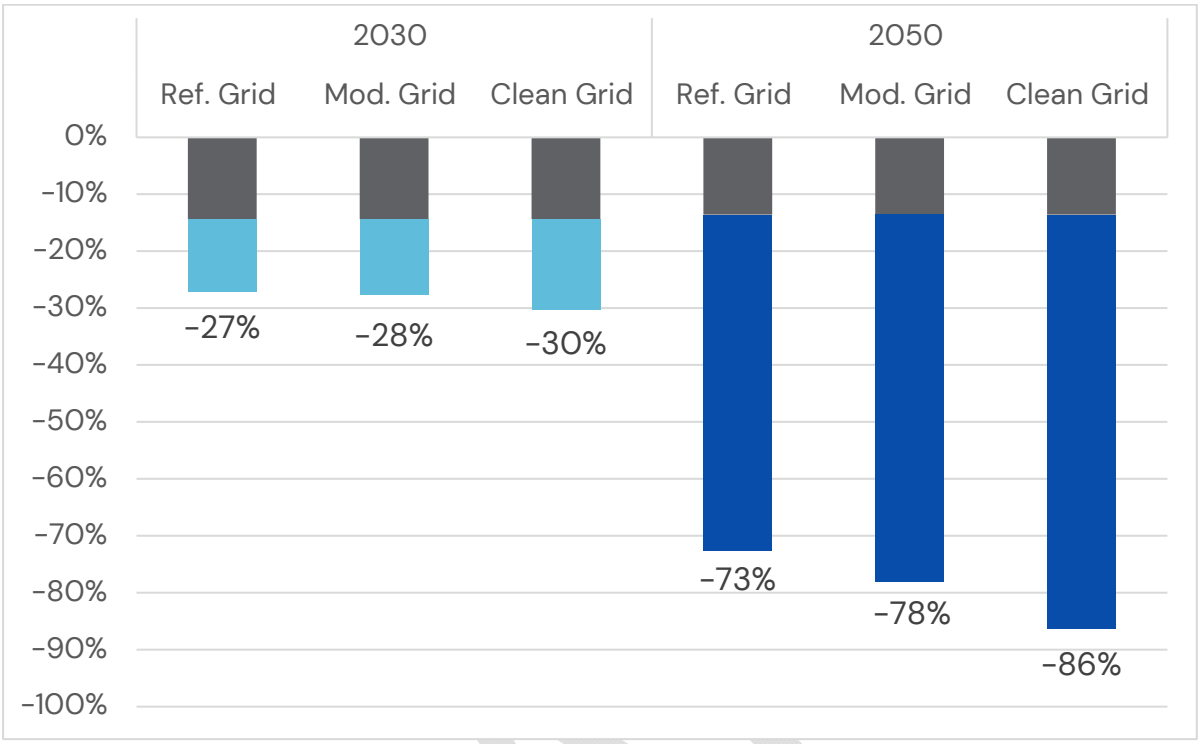


Figure 21. COMBO.2: GHG Reductions Compared to 2005

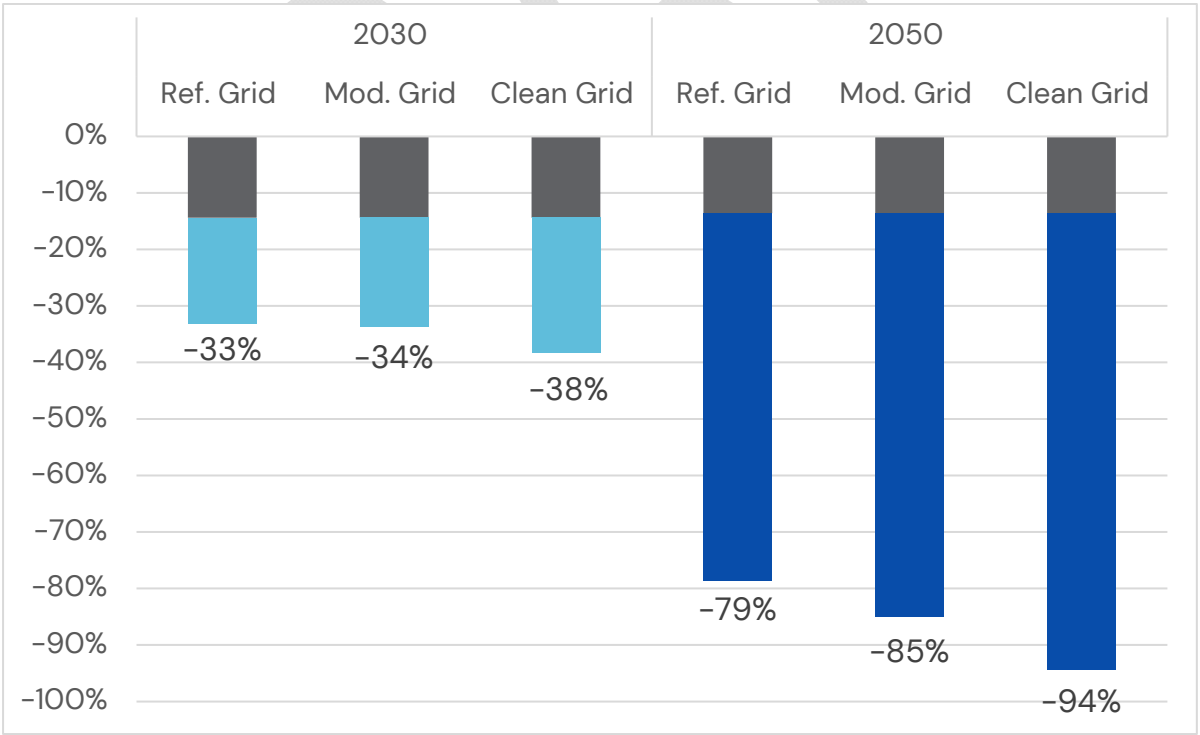


Figure 22. COMBO.3: GHG Reductions Compared to 2005

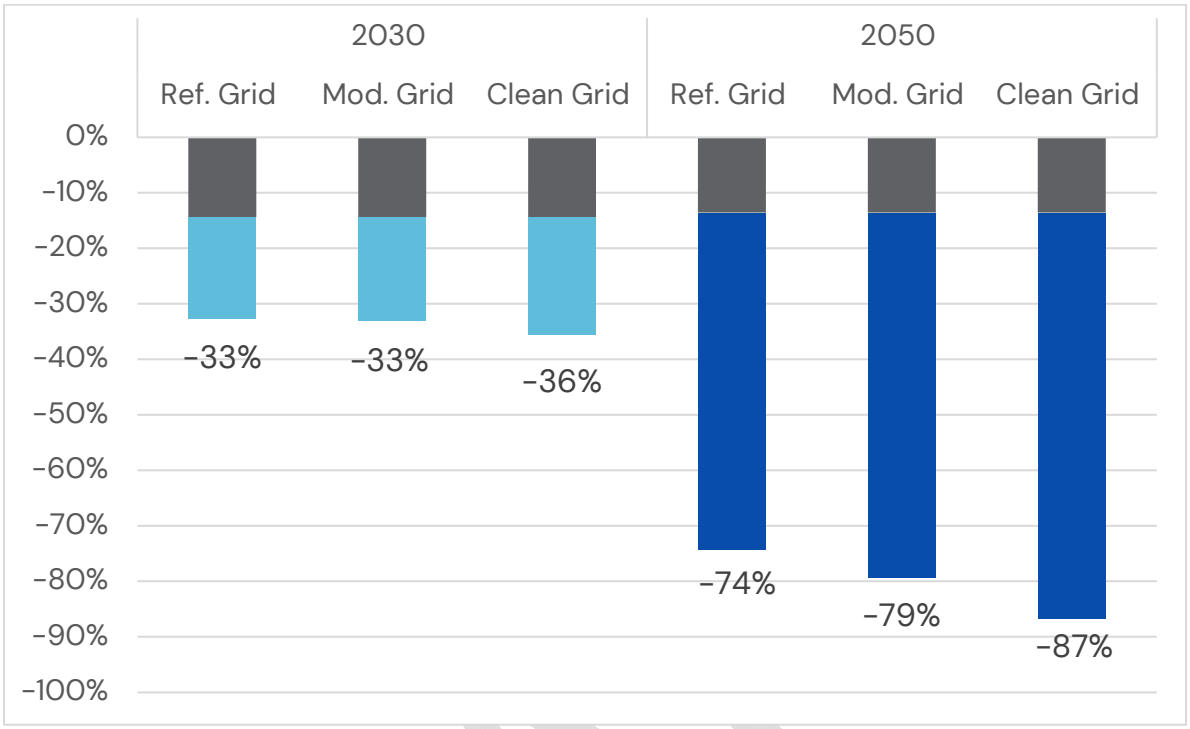
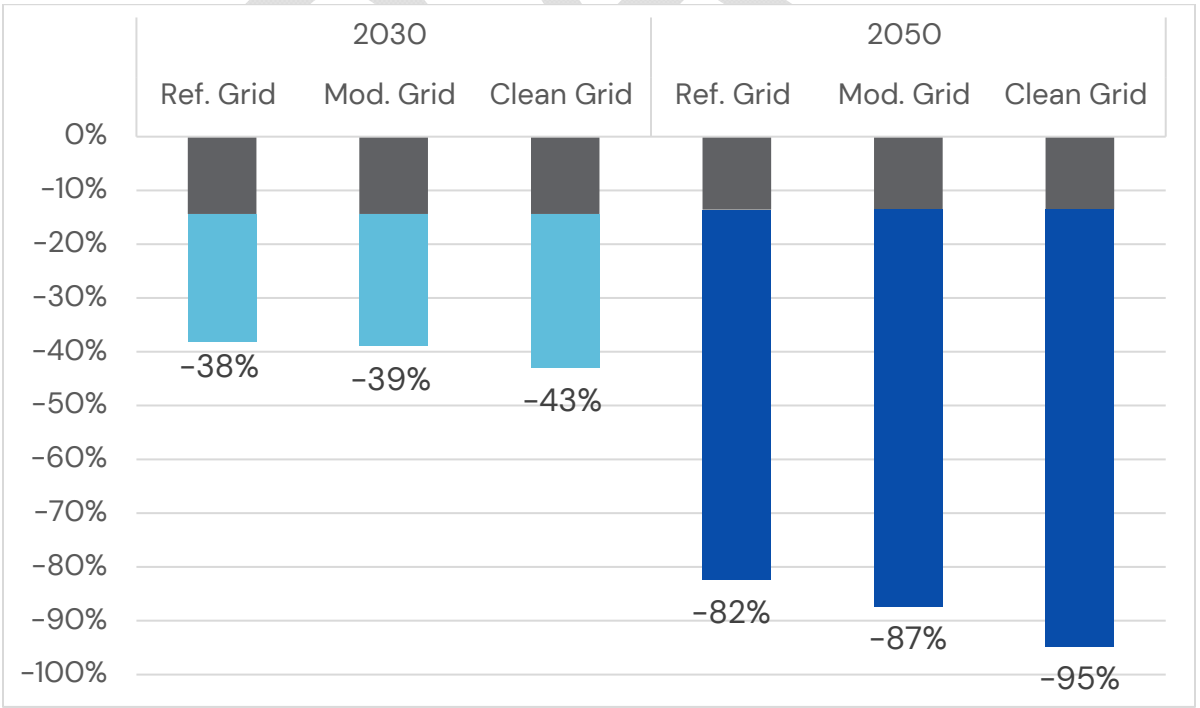


Figure 23. COMBO.4: GHG Reductions Compared to 2005



Implementation Considerations

The COMBO scenarios demonstrate the combined impacts of several GHG reduction scenarios, including Vehicle Technology and Fuels, Mode Shift and Travel Behavior, and Transportation Systems Management and Operations. Implementation considerations of all previous scenario types apply.

5 Implementation Considerations

This section provides a brief description of implementation considerations and outcomes that could be expected from the implementation of the strategies described in the scenarios. The considerations are centered around highlighting the co-benefits and costs of strategies, as well as equity implications.

Co-Benefits and Costs

Air Quality, Public Health and Safety

Any reduction in transportation emissions will generate air quality improvements. In the case of the VT scenarios, low-carbon fuels and EVs yield the largest improvement in local air quality due to the reduction or elimination (in the case of BEVs) of tailpipe criteria pollutants associated with fuel combustion such as nitrogen oxides (NOx), carbon monoxide (CO), particulate matter (PM), and other evaporative emissions such as Volatile Organic Compounds (VOCs), which contribute to the formation of photochemical smog. The strategies modeled under the MSTB scenarios also have air quality co-benefits, through the reduction in VMT and substitution of trips from personal single-occupant vehicles to other forms of transportation. This is especially true for trips that are substituted with non-motorized travel, such as walking and biking. In addition, VMT reduction strategies that rely on enhancing transit can reduce traffic congestion and improve general quality of life, while providing more mobility options and access to services. Further, transit and "active transportation" (e.g., biking and walking) strategies can work together, and when paired with micro-mobility solutions they can also serve as first-and-last-mile solutions for transit. EVs can also be incorporated in other mobility platforms, such as carsharing and ridesharing programs.

Expanding active transportation infrastructure as modeled under the MS scenarios can also make it safer for residents of different abilities to travel on foot or bike. Improved safety of the mobility ecosystem is also a co-benefit of the TSMO strategies, which significantly improves safety by significantly reducing crash rates on roads, and reliability of both roads and transit systems through mechanisms such as, for example, cordon pricing fee structures that regulate traffic flows. On the other hand, the benefits of TSMO strategies on GHGs may be expected to decline as more of the fleet transitions to hybrids and EVs, whose fuel economy does not decrease dramatically at low travel speeds, which can be encountered in situations of traffic congestion and can use technologies such as regenerative braking to improve fuel economy.

Economic

There are several economic co-benefits, as well, associated with each of the scenarios presented in this study. For the VT scenarios, the lower total cost of ownership of EVs would provide a potential incentive for switching, as EVs have notably lower operational and maintenance costs than conventional vehicles (usually 50% less[55]). In addition, , EVs offer the convenience of eliminating trips to the gas station. Widespread vehicle electrification is

[55] Preston, B. EVs Offer Big Savings Over Traditional Gas-Powered Cars. October 2020. https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/

also poised to generate local workforce development and employment opportunities for the installation and maintenance of private and public EV charging infrastructure.

The strategies included in the MS and TSMO scenarios generate economic co-benefits in the form of increased access to businesses and services through transportation service improvements. When paired with land use strategies and smart development, transit promotes economic activity through the creation of transit-oriented neighborhood, for example, which also generate more opportunity for social interactions within a community. MSTB strategies, such as cordon pricing and VMT fees, can provide steady revenue streams for state and local governments but can also help commuters and freight move more quickly by improving travel time reliability and congestion, with positive impacts on the economy. Finally, teleworking can enhance efficiency and productivity. However, for some stakeholders, the strategies considered here could cause economic losses: for example, reducing transit fares means that there will be some loss of revenue for transit agencies. At the same time, transit enhancements require significant, long-term spending, while the implementation of revenue-generating actions such as cordon pricing and VMT fees requires administrative and enforcement costs. Maintaining active transportation facilities may require new equipment, such as specific snow removal equipment. Finally, while teleworking can save employers and employees time and money, remote workers can generate less economic activity in downtown areas.[56]

Equity

Many of the analyzed strategies and scenarios have potential equity benefits and burdens that would need to be considered and addressed prior to their implementation.

The equity implications of the VT scenarios can be explored at different levels. On one hand, a zero-emission transportation future provides widespread equity benefits to the public, by improving air quality and public health. This is particularly relevant to communities living near freeways, which are typically medium- and low-income, and could especially benefit from zero-emission medium- and heavy-duty vehicles that contribute disproportionately to criteria pollutants associated with adverse health outcomes. However, low-income and minority communities experience financial and logistical barriers that prevent adoption of privately owned EVs, or of private forms of mobility altogether. In these cases, the implementation of both equitable measures in EV adoption (e.g., through low-interest loans, point-of-sale rebates, vouchers, and strategically placed infrastructure to enable EV charging for multifamily residences or for renters) and zero-emission transportation services (e.g., electric transit buses and school buses) is equally critical to offer more options and expand access to clean mobility.

Improved mobility and access to services through enhanced public transit and micromobility options can increase access to jobs, education, healthcare, food, and other key resources for all income levels, but has important equity implications for underserved communities who have less access to safe bike trails and/or private forms of mobility. Thus, enhancing transit while expanding active transportation infrastructure can play

[56] Bloom, N. How Working from Home Works Out. Stanford Institute for Economic Policy Research. June 2020. https://siepr.stanford.edu/sites/default/files/publications/PolicyBrief-June2020.pdf (stanford.edu)

an important role in enhancing mobility for the residents of Equity Emphasis Areas (EEAs).[57] Likewise, teleworking is not an option for all workers. The percentage of people with teleworking-capable jobs varies by race and income level,[58] and lower-paying jobs are typically the ones that require an in-person presence and are best served by a reliable and safe transportation system. Because many low-wage workers have work shifts during off-peak hours that typically feature lower transit service frequencies, cordon pricing and VMT fees can place an extra burden on low-wage workers and might make it more difficult for low-income individuals to access jobs inside the cordon areas.[59] Similarly, VMT fees that are based on vehicle type may be regressive, as low-income drivers are less able to afford newer, more fuel-efficient/alternative fuels vehicles. These equity impacts can be mitigated by designing policies that intentionally apply discounts based on income, such as a means-tested transit fares or other discounted pricing, and by using the revenues to invest in Equity Emphasis Areas. Finally, TSMO strategies that focus on vehicle and/or mobile application-based technology may also present equity challenges. For instance, real-time travel information on mobile apps is not accessible to those without mobile devices. As the region uses more technology to create smart, connected communities, it will be important to make sure not to leave those without access to the same tools behind.[60]

Policy Implementation Issues

Turning GHG emission reduction scenarios into actions will require a combination of policy measures at every level of government, as well as robust long-term planning and strong coordination between public and private stakeholders.

The role of the federal government remains critical for aspects such as setting up grants and incentive programs for EV purchases and EV infrastructure development (relevant for the VT Scenarios) and transit enhancement (relevant for the MS scenarios). While federal clean energy and clean transportation policies can also help spur action at the local level, state and local jurisdictions have a direct key role in the design and implementation of policies and programs that can turn these scenarios into actions. Tools that state and local governments can use include legislative processes to, e.g., set clean power grid requirements or ZEV mandates for new EV sales such

[57] Equity Emphasis Areas (EEAs) are a regional planning concept adopted in 2021 by the COG Board of Directors to guide future growth and investment decisions. EEAs are approximately 350 of the region's 1,222 total census tracts with high concentrations of low-income individuals and/or racial and ethnic minorities. EEAs were originally developed by the Transportation Planning Board to analyze transportation potential impacts of its long-range plan but will now be applied more broadly across disciplines. See and Sergio Ritacco, "Equity Emphasis Areas for TPB's Enhanced Environmental Justice Analysis - Environmental Justice," Metropolitan Washington Council of Governments, 2020, https://www.mwcog.org/transportation/planning-areas/fairness-and-accessibility/environmental-justice/equity-emphasis-areas/.

[58] Bay Area Council Economic Institute. "Remote Work in the Bay Area: An Initial Evaluation of the Data and Implications for Public Policy." December 2020. http://www.bayareaeconomy.org/wp-content/uploads/2020/12/BACEI_RemoteWork_12.21.20.pdf#page=11

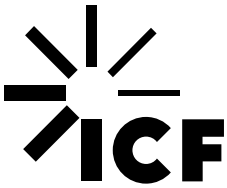
[59] Portland Bureau of Transportation. "Cordon Pricing: Background Memo." January 2020. https://www.portland.gov/sites/default/files/2021/poem_workingdraft_cordonmemo_clean.pdf

[60] Federal Highway Administration. "Transportation Systems Management and Operations (TSMO) in Smart Connected Communities." December 2018. https://transops.s3.amazonaws.com/uploaded_files/fhwahop19004.pdf

as those set by the Advanced Clean Transportation rules, and zoning/land use codes to implement transit and housing development strategies that reduce private driving and maximize sustainable mobility. Municipal codes are also key instruments that local governments have at their disposal to streamline processes that can help advance residential and commercial EV deployments.

While costs are seen as the main barrier to advancing the types of policies that would be required to roll out the programs described in these scenarios, lack of adequate planning, coordination, and agreement between stakeholders is often the largest impediment. As such, a multi-stakeholder approach where the local government facilitates discussions and collects inputs to be incorporated in program design is typically seen as the most successful long-term strategy to implement actions in a way that eliminates possible conflicts (this is particularly relevant for actions that might have real or perceived costs for some stakeholders and benefits for others, such as free transit or parking pricing) even when considering the short-term costs associated with education and awareness programming. The role of the private sector is also key, in both supporting and helping to shape proposed policies and programs. For example, collaboration with developers is key for a smooth implementation of land use policies; likewise, private employers play a key role in the shaping of telework or vanpooling policies.

In moving forward, policy makers will need to consider the costs, revenue implications, benefits, and equity implications of policy actions, and consider how transportation investments can best move toward GHG reduction goals while supporting the region's mobility, safety, economy, and community and other environmental goals.



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National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board

FROM: Kanti Srikanth, TPB Staff Director

SUBJECT: Climate Change Mitigation Study - Background and Context for Study Findings

DATE: December 15, 2021

The board is being briefed on the results of the Climate Change Mitigation Study (CCMS) that it initiated in January 2021. Members of the board received a more detailed briefing on the study, particularly its assumptions and the results of the analysis, in a special work session on Monday, December 13, 2021. This memo provides background for the study and an overall context to understand the scope of work and the findings of this study.

The CCMS has been a very timely and important initiative of the National Capital Region Transportation Planning Board (TPB). While the TPB has been engaged in this important topic since at least 2010,[1] there have been many other recent calls to action, such as 1) those made at the COP26 United Nations Climate Change Conference, held in Glasgow, Scotland, October-November 2021; 2) the recently announced federal national greenhouse gas (GHG) emissions reductions goal (50% to 52% below 2005 levels by 2030);[2] and 3) the prominent role of climate change mitigation in recent federal funding actions. Each of these speaks to the timeliness of TPB's CCMS. The study is intended to inform decision makers within the metropolitan Washington region (e.g., TPB member jurisdictions, and various agencies/stakeholders, including federal agencies), on the strategies to reduce GHG within the on-road transportation sector in this region and contribute to the efforts to attain the region's multi-sector greenhouse gas reductions goals for 2030 and 2050.

A NOTE OF THANKS

This study has also been an intensive work effort for staff and the consultant team. The study was launched in January of this year to address two questions that had been raised by the TPB in the fall and winter of 2020 while discussing the region's ability to attain the Metropolitan Washington Council of Governments' (COG's) GHG reduction goals. Thus, staff and the consultants had fewer than 11 months to complete this study, which involved the analysis of thirteen scenarios. I believe the scope of the analysis is comprehensive, the technical methods of the analysis are robust and

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[1] Monica Bansal and Erin Morrow, "What Would It Take? Transportation and Climate Change in the National Capital Region," Final Report (Washington, D.C.: National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, May 18, 2010), http://www.mwcog.org/uploads/pub-documents/qF5eXVw20110617114503.pdf.

[2] "Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies," Press Release (The White House, April 22, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/.

consistent with state of practice for such high-level, scenario-planning work. I trust you will find this to be the case as well.

TPB staff and the consultant team have worked long and hard – many late nights and weekends to complete the study on an expedited schedule. So, I take this moment to thank the staff of the TPB and the consultant team, particularly those listed below.

- ICF (particularly Michael Grant, Adam Agalloco, and Mike McQueen), Fehr & Peers, and Gallop Corporation
- TPB staff (particularly Erin Morrow, Dusan Vuksan, and Mark Moran)

CONTEXT TO UNDERSTAND THE STUDY FINDINGS

While the study follows the long-standing interest and work of the TPB on the matter of climate change planning/mitigation, and builds on its previous studies, it is useful to note four points that provides context for this study.

1. By undertaking this study and other related actions (e.g., revisions to the project solicitation document of the long-range transportation plan and the recent Voices of the Region survey), the TPB recognizes that taking actions to mitigate and adapt to the effects of climate change is both a national and regional priority. The TPB did this last year when it endorsed COG's regional goal to reduce GHG emissions from all sectors to achieve a total reduction of 50% by 2030.

   As part of its endorsement, the TPB reaffirmed its commitment to do its part within the on-road, transportation sector to reduce GHG emissions, leading to this study. I say to do its part because the regional GHG reduction goals are multi-sector, not sector-specific, meaning the 50% and 80% reduction goals for 2030 and 2050 respectively, are not allocated in specific amounts to the individual sectors (e.g., energy production, residential/commercial buildings, and transportation). Despite this, the TPB's approach has been to take the regional reduction levels as applicable to each sector. This has meant that, for this study, the study team chose to make its goals to reduce on-road, transportation-sector GHG emissions by 50% by 2030 and 80% by 2050.

2. When COG adopted the multi-sector 2030 GHG reduction goal last year, it did a preliminary analysis to determine if the region could meet its new 2030 GHG reduction goal if every sector took a set of actions to reduce GHG. The answer was yes, according to the Metropolitan Washington 2030 Climate and Energy Action Plan (CEAP).[3] This analysis examined two broad types of actions within the transportation – (1) converting vehicles to clean fuel and (2) reducing the amount of on-road travel, i.e., reducing vehicle miles travelled (VMT).

[3] "Metropolitan Washington 2030 Climate and Energy Action Plan" (Washington, D.C.: Metropolitan Washington Council of Governments, November 18, 2020), https://www.mwcog.org/documents/2020/11/18/metropolitan-washington-2030-climate-and-energy-action-plan/.

In January, with these two types of actions in mind - converting vehicles to clean fuel and reducing VMT - the TPB asked staff two specific questions: What types of actions and what level of outcomes from these actions would be needed to reduce the on-road sector's GHG emissions by 50% by 2030 and 80% by 2050? The CCMS was designed to answer these two questions.

3. The scope of the CCMS is limited to the reduction in GHG that one might expect within the on-road, transportation sector. Thus, even if a proposed scenario shows that transportation will not reduce on-road GHG by 50% by 2030, it does not mean the region cannot achieve its multi-sector 50% GHG reduction goal. The region could still achieve its multi-sector GHG reduction goals with the actions from the other sectors as outlined in COG's 2030 Climate and Energy Action Plan.

   Conversely, if the answer from this study is "yes, a particular scenario can reduce on-road transportation GHG by 50%", it does not mean that the region's multi-sector GHG reduction would be met with no other actions from the other sectors.

4. Consistent with the available time and funding resources for the study, the CCMS utilized a scenario-planning approach with mostly sketch-planning tools, which has two resultant consequences. First, the analysis is at aggregate or regional level, and not at the level of an individual project or program. The analysis assumes the outcomes and not all the different ways we can achieve those outcomes. Second, because the study relied mostly on sketch-planning tools and due to the unprecedented implementation levels and general uncertainties associated with the assumptions, the results of the analysis represent order-of-magnitude estimates of the changes in GHG emissions one may expect if all the outcomes are achieved by various program and policies.

   Additionally, it must be noted that for the ten bottom-up scenarios analyzed, each scenario is a combination of different strategies (programs and policies) to achieve a specific outcome. Also, the levels of outcomes assumed from these strategies vary between the scenarios. For example, if scenario one assumes transit fares will be reduced by 40%, scenario two might assume that transit will be fully free.

   It is my belief that the strategies and the levels of implementation assumed in this study are unprecedented and extremely aggressive! The study did not constrain its assumptions by questions the actions that would be needed to implement the strategies. Questions such as:

   a. How would the region achieve these levels of changes?
   b. Would the region be able to enact some of the specific policies?
   c. How would the region secure the community's acceptance to implement these programs and policies?
   d. What amount of funding would be needed to develop, operate, and maintain these programs?

The study stayed focused on the questions asked by the TPB – what actions and what levels of outcomes from these actions would be needed to maximize GHG reductions in the on-road, transportation sector. In summary, the results tell us where we will need to be, in 2030 and 2050, but they do not tell us how to get there!

I believe how we get there will be the hardest part to figure out and one that we will require coordination, consultation, and cooperation among all TPB members and the region's transportation planning stakeholders. I also believe that the outcomes identified in this study cannot be achieved overnight and will not only take several years, but they will require sustained commitment at all levels of government (local, state and federal), contributions from the industry/commercial sector, and importantly the public. I do not believe any of these will be easy nor do I believe it will be cheap. However, I do believe the cost of inaction will be much higher!