October 13, 2022

Stephanie Pollack
Acting Administrator
Federal Highway Administration
1200 New Jersey Ave SE
Washington, DC 20590

Subject: National Performance Management Measures; Assessing Performance of the National Highway System, Greenhouse Gas Emissions Measure (Docket No. FHWA-2021-0004)

Dear Acting Administrator Pollack:

The American Association of State Highway and Transportation Officials (AASHTO) is pleased to provide comments on the Federal Highway Administrations (FHWA) Notice of Proposed Rulemaking (NPRM) on "National Performance Management Measures; Assessing Performance of the National Highway System, Greenhouse Gas Emissions Measure (Docket No. FHWA-2021-0004)", published in the Federal Register on July 15, 2022. AASHTO is a nonprofit, nonpartisan association representing the state transportation departments (state DOTs) in the 50 states, the District of Columbia, and Puerto Rico, with the mission to support state DOTs to connect America with the transportation system of today and tomorrow.

AASHTO and the state DOTs recognize the urgency and need to address and mitigate climate change given its harmful impacts to both the natural and built environment—and thus strongly support the overall goal and intent of reducing greenhouse gas (GHG) emissions. Recognizing a wide array of approaches that can be taken to tackle this global objective, the specific GHG performance measure and the associated target-setting framework required for state DOTs under this NPRM has not received consensus support among AASHTO's member departments. Some of our members are very supportive of the language and/or the intent of the NPRM and they encourage FHWA to move forward with finalizing the NPRM as proposed. That being said, some of our members are opposed to the NPRM for many different and specific reasons—beyond the broad intent to address climate change—and recommend FHWA to not implement the NPRM, or at the least make substantial changes.

Beyond the specific discussion around this NPRM, all states recognize and are addressing the effects of extreme weather impacts and climate change due to GHG emissions. Accordingly, all state DOTs are addressing extreme weather impacts as part of their transportation asset management plans which serve to guide their investment decisions. In addition, many states are developing resilience improvement plans to holistically understand how they can make the

transportation infrastructure more resilient to withstand the effects of extreme weather and climate change.[1]

The transportation sector is one of the three largest sectors contributing to US GHG emissions accounting for 27 percent, which is slightly more than electric power (25 percent) and industry (24 percent).[2] Clearly, the transportation sector in general, and the US Department of Transportation (USDOT), US Environmental Protection Agency (EPA), and state DOTs share a role in working to reduce GHG emissions and its negative impact on climate. Many state DOTs are creating short- and long-range plans and taking action to reduce GHG emissions, and others are taking active steps to better understand how they can contribute to a reduction in the GHG emissions through strategies and projects that they can directly control and influence. However, based on a cross-section of state DOT input that AASHTO received, not all state DOTs have the same ability to directly affect the reduction in GHG emissions, nor do they have control over certain strategies and tactics that may look promising for reducing GHG emissions. These strategies and actions will vary by state and, like other state and federal transportation goals, require different approaches appropriate to the specific state context. For example, within a state, there are limitations to what may work in a rural area versus an urbanized area. And while the adoption of electric vehicles (EVs) and hybrid vehicles is a highly promising vehicle-oriented approach both in the near- and long-term, a state DOT's role and responsibility as an infrastructure owner and operator provides limited direct control on the fleet transition to EVs and hybrid vehicles which will help to decarbonize the transportation sector.

The varying degree of direct influence that state DOTs can provide on GHG emissions does not mean that state DOTs do not have an important role to play. To the contrary, a recent publication from the Transportation Research Board of the National Academy of Science, Engineering and Medicine entitled *Reducing Greenhouse Gas Emissions: A Guide for State DOTs* provides a comprehensive assessment of how a state DOT can meaningfully address GHG emissions through a multistep process that begins with developing an inventory to understand what the agency and the users of the transportation system are emitting and continues with developing and implementing mitigation strategies, monitoring results, and making adjustments.[3] The guide lists ten different steps (e.g., institutional alignment, communication and public engagement, and implementation) across ten different functional areas (e.g., executive level, planning/programming, construction, and administration) where a state DOT does have an important and significant role to play. Ultimately, the guide results in a list of actions the state DOT can undertake (e.g., transit operations, asset management practices, emissions data/analysis, planning for multimodal projects) in order to reduce GHG emissions.

AASHTO and the state DOTs also understand and appreciate that what we measure matters. State DOTs have served as stewards of the federal performance management framework that was enacted in 2012 in the Moving Ahead for Progress in the 21st Century (MAP-21) Act. Since initial implementation began in 2013, with the full effect of the federal law and subsequent iterations of regulations being in place since 2018, the state DOTs have delivered on the

[1] See the meetings and webinars sponsored by the AASHTO Committee on Transportation System Security and Resilience available at https://ctssr.transportation.org/. Accessed 9/28/2022.
[2] Source: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks. Accessed 9/28/2022.
[3] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.

Congressional intent of the performance management provisions which is to provide a consistent framework to measure the performance of the transportation system. Under state DOTs' leadership, the national performance management framework has been implemented in a manner that advances a safer and more efficient transportation system without imposing significant undue regulatory burdens on states. Given the scale and complexity of this framework, there continues to be recognized challenges ahead to further accomplish a safer and more efficient transportation system; AASHTO and the state DOTs look forward to engaging with our important partners at USDOT to address these challenges.

Given AASHTO and the state DOTs' clear support for addressing climate change and reducing GHG emissions, we do, however, have a number of important concerns with the particular and definitive approach proposed in this NPRM. First, in this NPRM, FHWA presents a case for legal authority to establish this new rule. From our review, we do not see a provision in federal law that requires FHWA to establish a GHG emissions performance measure. Furthermore, 23 USC 150(c)(2)(C) specifically states that USDOT shall "limit performance measures only to those described in this subsection". This is of concern to many of the state DOTs, though not all. In addition, FHWA's interpretation of 23 USC 150 to justify its legal authority for establishment of this new rule can lead to consequences beyond the intent of Congress, setting a precedent for future interpretations leading to establishment of new and additional performance measures without Congressional authorization.

Second, the proposal includes new target-setting requirements that are not consistent with, if not contrary to, federal law and would represent a major departure from current practice—where FHWA would be directly involved in setting state-specific targets by establishing that GHG targets must remain constant or decrease and must achieve a specific long-term goal. However, existing statute has not changed the fact that the "State" sets targets. We also point out that this NPRM is inconsistent with FHWA's own guidance on overall performance management and target-setting which states that:

> "*The FHWA strongly discourages the use of aspirational targets. In 23 CFR 490.101, a target is defined as a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period required by FHWA. Setting aspirational targets that are not data-driven, realistic, or achievable does not align with the performance management framework or the stated congressional policy to improve project decision-making through performance-based planning and programming…*"[4]

Third, AASHTO believes that calendar year 2021 is not an appropriate baseline year for this GHG measure due to the COVID pandemic. Specifically, we disagree with FHWA's assertion that 2021 is the most appropriate base year since it is the most recent year for which data will be complete and available. Many states have evidence to show that their systems are still recovering and had not normalized by the end of 2021. In fact, many states see it to be probable that near-term vehicle miles traveled (VMT) will continue to rebound closer to pre-pandemic levels, setting states up to struggle to meet targets that are not objectively reflective of ongoing system performance. We believe 2022 should be the earliest baseline year for target setting under any rule that would be advanced in this docket.

[4] FHWA Transportation Performance Management Frequently Asked Questions, Target Setting, *Should aspirational targets be used as performance targets?*, available at https://www.fhwa.dot.gov/tpm/faq.cfm. Accessed 9/28/2022.

Finally, we believe FHWA has significantly underestimated the costs it will take to implement this major rulemaking in terms of direct cost to each transportation agency—both state DOTs and MPOs—to implement the proposed rule; the opportunity cost of having to meet the targets established in the rule; and unintended costs to the transportation program associated with a funding model based primarily on the sale of fossil fuels which this proposed rule would propose to significantly reduce.

AASHTO comments are organized as follows in the attachment to this letter:

- **Principal Comments**—There are seven principal comments for which AASHTO provides an in-depth analysis and discussion.
- **AASHTO Response to FHWA Requests**—AASHTO response to the questions specifically asked by FHWA in the NPRM.
- **Appendix A**—AASHTO's Documentation and Analysis of Potential GHG-Reducing Actions.

Again, AASHTO fully acknowledges that these comments do not represent consensus among all AASHTO members; however, they do represent a substantial and considerable effort among AASHTO's state DOT membership to provide their perspectives on the proposed NPRM thorough a multistep interdisciplinary review process representing multimodal and technical disciplines related to transportation performance management. AASHTO has encouraged all member departments to submit their own comment letter as part of this docket and those comments will include valuable information and insights for FHWA to consider along with those included with this comment letter. Should FHWA consider revisiting the currently proposed GHG emissions performance measure, AASHTO would very much welcome the opportunity to collaborate with FHWA and the transportation industry to identify a performance framework that would more effectively reflect the ability of a state DOT to demonstrate a positive impact on the reduction of GHG emissions.

We appreciate the opportunity to provide these comments and look forward to working with FHWA. If you would like to discuss the issues raised in this letter, please contact Matthew Hardy, Ph.D., AASHTO's Senior Program Director for Planning and Performance Management at (202) 624-3625 or mhardy@aashto.org.

Sincerely,

Shawn D. Wilson, Ph.D.
President, American Association of State Highway and Transportation Officials
Secretary, Louisiana Department of Transportation and Development

PRINCIPAL COMMENTS

AASHTO and the state DOTs recognize that greenhouse gas (GHG) emissions have an impact on the natural environment and resulting effects on the built environment, and strongly support the overall goal and intent of reducing GHG emissions, consistent with economic growth and mobility for people and business. At the same time, AASHTO wants to make clear at the start of these comments that some of our members are very supportive of the language and/or the intent of the NPRM. Also, some of our members are not supportive of the NPRM for many different reasons including the legal basis that FHWA asserts for authority to require the GHG emissions performance measure.

However, an important intent of our comments is to provide substantive input regarding the proposed GHG emissions performance measure and management requirements so that if FHWA makes the decision to move forward with a final regulation, it can do so in a well-informed manner that understands the perspective of the state DOT community including addressing concerns noted and makes vitally important modifications that we recommend.

1) THERE ARE CONCERNS ABOUT FHWA'S JUSTIFICATION FOR THE ESTABLISHMENT AUTHORITY

AASHTO and the state DOTs are generally supportive of the performance management provisions included in MAP-21 and the FAST Act as implemented to date and believe that with the continued effective implementation of Federal performance management regulations we will see a more effective Federal transportation program to complement ongoing state efforts to achieve a safer and more efficient transportation system. Further, AASHTO members recognize that CO_2 emissions have an impact on climate and support the goal of reducing CO_2 emissions from the transportation sector. But the rule has various features and there are a number of state DOTs that are supportive of the NPRM and its intent, while other state DOTs are not supportive of the NPRM for many different reasons including the legal basis asserted by FHWA.

That said, AASHTO has significant concerns with respect to FHWA establishing additional national-level measures beyond those explicitly required by Federal statute. State DOTs have chosen and continue to expand their efforts to adopt their own state-level performance measures in a variety of areas, including environmental performance measures such as GHG emissions. For example, some states have established statewide GHG performance measures and many states have adopted climate change goals and action plans, even without federal requirements.[5] However, the measures, processes, and methodologies vary greatly from state to state, and that experience will continue to inform this process going forward and more states will likely adopt variations of the approaches being developed by their peer states and adopted to their specific needs, available resources, and goals.

AASHTO disagrees with the asserted justification provided in the NPRM regarding the legal authority for FHWA to establish a GHG emissions performance measure. First, 23 USC 150(c), which provides the statutory authority for performance management requirements, states in 150(c)(2)(C) that USDOT shall "limit performance measures only to those described in this

[5] See, for example, Minnesota DOT: https://www.fhwa.dot.gov/tpm/reporting/state/emissions.cfm?state=Minnesota. Accessed 9/28/2022.

subsection." The statutorily-described list is specific and explicit and does not list GHGs. The legal authority provided by FHWA to establish a GHG emissions performance measure could be seen as a precedent for USDOT, under this or a future administration, to promulgate even more Federal performance measures that are not listed in subsection 150(c).

Second, Congress was well aware of the prior inclusion of a GHG measure under the 2016 NPRM (*National Performance Management Measures; Assessing the Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program* proposed rule (Docket Number FHWA-2013-0054)); the final rulemaking; and then its repeal (Docket Number FHWA-2017-0025-0007, see May 31, 2017 Federal Register). While some lawmakers have publicly opposed or supported the GHG emissions performance measurement requirement, and legislation to authorize such a performance measure was advanced, Congress did not take action to include this specific measure in the Infrastructure Investment and Jobs Act (IIJA), whether as part of its climate change-related provisions or any other performance management changes.

Finally, as we have seen in changes to Administration policies over the past decade, there have been significant pendulum swings regarding USDOT support for the GHG emissions performance measure. The recent *West Virginia v. EPA* US Supreme Court ruling established a stricter interpretation of statutes that grant executive authority to federal agencies. This may be especially pertinent as 23 USC 150(c) does not explicitly require a GHG performance measure, nor does 23 USC 150(b)(6) explicitly state that reducing GHG is a national goal.

2) GHG Performance Metric as Proposed can be Readily Calculated but is Hard to Manage

The GHG emissions performance metric being proposed in the NRPM is straightforward to calculate and the data, in general, is readily available to all state DOTs. State DOTs have ready access to the fuel sales data, fuel efficiency factors, and estimated vehicle miles traveled (VMT) on the roadway system. In fact, some state DOTs, such as Minnesota DOT and Washington State DOT,[6] are regularly reporting on the proposed performance metric within their regular national performance management report.

While the proposed GHG emissions performance metric can be readily calculated, the ability of state DOTs to directly affect GHG output is limited and will be hard to manage or influence. The three main components of the proposed GHG emissions performance metric are fuel sales, fuel efficiency factors, and estimated VMT. State DOTs are generally non-regulatory agencies, thus have limited ability to: a) limit fuel sales or the type of vehicles sold which would affect fuel sales; b) require a certain vehicle fleet mix or turnover rate of the vehicle fleet mix which would affect fuel sales; or c) manage and dictate where people live or how people travel which would affect estimated VMT. However, state DOTs can support many different actions that a state or local agency could take to affect fuel sales or VMT which would lower GHG emissions. The conclusion of *NCHRP Web-Only Document 308 (Methods for State DOTs to Reduce Greenhouse*

[6] See https://www.fhwa.dot.gov/tpm/reporting/state/emissions.cfm?state=Washington and https://www.fhwa.dot.gov/tpm/reporting/state/state.cfm?state=Minnesota. Accessed on 9/28/2022.

Gas Emissions from the Transportation Sector) is that there is no silver bullet for a state DOT but they can, and should, lead by example.[7] For example, state DOTs can:

- Support electric and alternative fuel vehicle infrastructure for light and heavy vehicles, clean transit, and clean fleets.
- Implement intelligent transportation systems (ITS)/efficient traffic operations.
- Invest in and support low-carbon travel alternatives and incentives to manage demand for vehicle travel.
- Use low-carbon, recycled/reused materials, where feasible.
- Switch to clean fuel light and heavy vehicles.
- Collaborate with other state, regional, and local agencies.

And, there are many other options a state DOT can support such as pricing of the transportation system, improved operations, consumer education, and supporting the use of other transportation modes (transit, bike, pedestrian, etc.). At the local level, state DOTs can support local agencies in land use and community design initiatives resulting in more compact development requiring less VMT. These types of actions would likely result in reduced fuel sales and less estimated VMT.

Performance management is predicated on the assumption that in order for a performance measure to be meaningful, it must be actionable by the entity that is being held accountable. As proposed, the GHG emissions performance metric would be defined as an outcome measure that is affected by many different factors outside the control of the state DOT. In some respects, the proposed GHG emissions performance metric is similar to the five national performance measures for safety that all states must report on as transportation safety is not only affected by the state DOT but many other state agencies as well. However, for the safety performance measures, state DOTs set the targets based upon a data-driven analysis of what is feasible in the future, which is not the case for the GHG performance metric. These two sets of measures are in contrast to other federal performance measures, better defined as asset and output measures, such as interstate pavement condition, over which DOTs exert direct and predictable influence through data-driven analysis and strategic investment decisions. ln this context, AASHTO notes that while state DOTs will be held accountable for meeting a pre-determined target level for the GHG emissions performance measure, they will have limited influence over the factors that have the potential to really move the needle on transportation-sector GHG emissions—specifically driver behavior and fuel efficiency. As such, it is not clear how states can set meaningful and declining GHG emissions targets. Thus, a question for FHWA is how they envision state DOTs utilizing the new performance measure to lower GHG emissions.

In order to answer that critical question of what a state could do, AASHTO developed a State-Level Transportation GHG Calculator model in Excel that state DOTs could use to assess how emissions in their state could be affected by various tactics and strategies.[8] The intent of the tool is to provide more clarity and examples to state DOTs on how they could affect emissions levels as measured by the proposed GHG performance metric. The State-Level Transportation GHG

[7] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.

[8] A more complete description of the scenario analysis and tool used are provided in Appendix A. The AASHTO State-Level Transportation GHG Calculator model and documentation is available at http://www.tpm-portal.com/ghg-nprm/.

Calculator model calculates CO_2 tailpipe emissions for the overall transportation system and NHS based upon an estimate of VMT and vehicle fuel sales in future years. The tool enables an analyst to model different scenarios to include factors such as Annual VMT Growth, vehicle fleet mix, journey to work data, vehicle fleet efficiency, population growth, and EV fleet penetration. Once a scenario is modeled, an analyst can determine to what extent a state DOT may have any type of influence over the model output. The purpose of the model is to support state DOTs to better determine what a reasonable target might be for the GHG emissions performance measure and/or to what extent they will have control over reaching a certain target.

For purposes of AASHTO's response to this NPRM, four scenarios, along with a baseline, were established and modeled after the *NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs*.[9] The scenarios illustrate the potential impact of key parameters on future GHG emissions. For each state and scenario, GHG emissions were predicted 1, 5, 10, 20, and 30 years into the future from the baseline date of 2022. The ten states include two each from the Northeast (Maine and Massachusetts), Southeast (Florida and South Carolina), Midwest (Kansas and Minnesota), Southwest (Nevada and Texas), and West (Washington and Wyoming). These states were selected as representative examples from each geographic region. For the scenario analysis, baseline assumptions were made about baseline population growth with the other parameters and inputs being changed to represent one of the following scenarios:

- Scenario 0: Baseline—VMT growth continues at historic average level, no change mode share or fuel efficiency.
- Scenario 1: EV Transition—All new automobiles sold will be EVs by 2035.
- Scenario 2: Increased Transit and Work from Home (WFH)—Transit reverts to pre-COVID level and WFH gradually increases back to COVID levels by 2030.
- Scenario 3: Reduced Vehicle Miles Traveled (VMT)—Land use and other policy changes occurring by 2040 result in VMT growth limited to population growth by 2050.
- Scenario 4: Combination—The variable changes from Scenarios 1, 2, and 3 are combined at one-half of each of the changed amounts.

The analysis was conducted by performing 260 runs in the AASHTO State-Level Transportation GHG Calculator, a spreadsheet tool implemented in Microsoft Excel. The tool uses data on fuel consumption and percentage of VMT on the NHS to estimate baseline GHG and NHS GHG emissions. It predicts future emissions by scaling the baseline value based on changes in VMT and fuel efficiency. Various factors contribute to these changes, such as:

1. EV % of Automobile Fleet
2. % of Future Work Trips Driving Alone
3. % of Future Work Trips Carpooling
4. Annual VMT Growth

The conclusions of the scenario analysis show that the deployment of EVs results in a significant reduction in GHG emission relative to the other scenarios. The reduction was seen in all ten states. The question here becomes what role does a state DOT (versus another state agency or

[9] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.

NHTSA through its regulatory authority) have in affecting this scenario. Scenario 2 resulted in a modest reduction in GHG emissions with the key issue being that only 20 percent of automobile trips are work-based trips and therefore do include a majority of automobile-based trips. In order to see a greater impact on GHG emissions, state DOTs would need to target non-work auto trips and/or truck trips. For scenario 3, reduced VMT growth rate results in GHG reduction but only in states with lower baseline VMT growth. Scenario 4 consistently results in a reduction in GHG emissions greater than that for Scenario 2 but less than that for Scenario 3.

As proposed, state DOTs have very limited authority to implement changes that result in lowering of GHG as modeled by the GHG emissions performance measure. The strategy that best aims to reduce tailpipe emissions is the adoption of EVs. According to current research, lean vehicle and fuel technologies—including vehicle efficiency/GHG emissions standards, electrification, and other low-carbon fuels—are likely to make up the majority of emission reduction potential. For the most part, state DOTs do not directly control policy related to these strategies, but DOTs can play important supporting roles, such as developing EV infrastructure and all state DOTs have developed EV Charging Infrastructure Plans to support the switch to EVs.

Another important aspect for all state DOTs is providing mobility options for people resulting in a reducing overall demand and improving system efficiency. According to the analysis, the improvements needed to reduce overall demand would likely not result in a 50% reduction of GHG in less than eight years to meet the 2030 target. Research conducted through NCHRP suggests that demand reduction and systems efficiency strategies also play an important role in reducing GHG emissions. The estimated reduction potential ranges from modest (a few percent) to significant (10s of percent) depending upon the strategies that are included and the level of aggressiveness assumed. However, some of the more optimistic estimates of reduction potential rely on unproven technologies (such as connected vehicles supporting "eco-driving") or very high levels of pricing that are generally unattainable in today's environment.[10]

Taking a pragmatic view of the proposed requirement for state DOTs to set targets that align with the 50% reduction of GHG by 2030 (from 2005 levels) and net-zero emissions by 2050 reveals significant concerns because these targets are not broadly attainable and ignore the unique scenarios of each state. AASHTO has concerns with the achievability of this target, but feels that reductions in GHG would likely accelerate closer to 2050 as improved technology, modal options, and technology become more widely integrated into the transportation network and larger scale shifts occur well beyond the control and influence of the state DOT. Current research supports this conclusion and states that:[11]

> "*Even with a combination of all strategies applied at aggressive levels of implementation, it is challenging to meet targets of 75 to 80 percent GHG reduction or more by 2050. Studies are in general agreement that doing so will require widespread electrification, decarbonization of the electric grid, and policies to manage vehicle travel demand.* [Furthermore,] *most strategies require implementation at multiple levels (State, regional,*

[10] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.
[11] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.

local) and across multiple agencies and organizations (executive, transportation, environmental, community development, utilities, etc.) to be fully effective. DOTs cannot "go it alone" when it comes to reducing transportation emissions."

Given the amount of time available to develop these comments, AASHTO was not able to work with our members to provide recommendations on an alternative performance metric. If FHWA does intend to move forward with a GHG emissions performance measure, AASHTO would encourage FHWA to re-open this topic for discussion prior to finalizing the new regulation and would welcome the opportunity to collaborate with FHWA.

3) DEVELOP A REALISTIC IMPLEMENTATION TIMELINE

Under the proposed rule, states are required to establish initial GHG emissions targets by October 1, 2022. However, the comment period for the proposed rule closes October 13, 2022. Clearly, the October 1, 2022 start date is unrealistic and not achievable. Even if the NPRM had been published one year earlier, it is unlikely that state DOTs would have had enough time to implement the new regulations for two reasons. First, state DOTs do not have the resources (time, staff, and funding) to do the work necessary to collect the data, conduct the analysis, and work with stakeholders to establish targets associated with the new performance metric. Second, there is a significant amount of coordination that is required for establishing a target for a brand-new performance measure. For example, in Arkansas, the target setting associated with the GHG emissions performance metric will involve coordination between two MPOs, three state DOTs, three FHWA Division Offices, two Federal Transit Administration Regional Offices and two Environmental Protection Agency Regional Offices. Other states will have substantially more agencies to coordinate with and the time involved cannot be dismissed nor made trivial with respect to a realistic implementation timeline.

It is important to note that, per 23 USC 150(d)(1), for any measures that are established, "States" must set targets not later than one year after the effective date of the rule. Ideally, FHWA would set the effective date of the rule for one year before the first reporting deadline when the state would formally report targets, otherwise there will be an issue with syncing up the target establishment and reporting. This occurred when PM2/PM3 became effective; state targets were due by May 20, 2018, because it was one year after the rule's effective date, but the targets weren't formally reported until the baseline report due October 1, 2018. This leads to confusion not only with the state target-setting timeline, but the MPO timeline as well.

FHWA had previously indicated that it wants to use the existing federal performance management framework with respect to the timing aspects of implementation of the GHG emissions performance measure. In accordance with this guiding principle, it is therefore critical that the performance periods and reporting process/timeline align with the other PM2/PM3 reporting requirements. The most sensible two options are either:

1) Not require states to set two-year targets for the 2022-2025 time period, and have states set their four-year targets for the 2022-2025 time period as part of the October 1, 2024 mid-performance period progress report.
2) Delay implementation altogether until the 2026-2029 performance period.

AASHTO does not support state DOTs being required to establish any type of interim GHG emissions performance target that would be due on October 1, 2023. This would require a

significant amount of time and resources that would have to be spent again, twelve months later, for the for the October 1, 2024 mid-performance period progress report. In addition, if the rule is implemented with respect to the national goal for net-zero GHG emissions by 2050, then all of the state DOTs and partner agencies know what the long-term goal will be regardless of when the first reporting period is identified.

4) FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting

Target setting is a significantly data-driven and multidisciplinary process that is practiced by all states. The performance management provision in the U.S. Code, 23 USC 150 is clear that each "state" shall set performance targets that use the measures developed by USDOT. Furthermore, it is AASHTO's position that every state and political subdivision faces different constraints and opportunities affecting their transportation system. Available funding is a particularly important variable for states in planning and target setting, but there are other factors, including economic conditions, environmental conditions, population growth trends, legislative and gubernatorial mandates and priorities, and issues identified in the public involvement process. Consequently, it is essential that states and MPOs have the flexibility to set targets, including targets that have performance holding steady or, in some situations, declining. This flexibility is critical to state DOTs in order to balance the breadth of performance measures they must address and needs to be corrected in any final rule in this docket.

AASHTO has consistently stated that state DOTs must maintain the ability to set targets for any of improving, declining, or constant performance because an important purpose of performance management is to answer two broad questions:[12]

a. **What performance can be achieved?** In other words, what type of performance level can be achieved given the resources available; or
b. **How much resources are needed?** In other words, how much funding is needed to achieve a certain performance level established by someone else.

This NRPM does not allow a state DOT to address either question because USDOT would define the performance level a state DOT has to achieve (net zero emissions by 2050) as well as the resources they have to achieve that performance level (federal formula and grant funding). Thus, a state DOT would be held accountable for a certain performance level using the resources made available to them and penalized if they are unable to achieve the prescribed target.

In addition, this NPRM goes well beyond statutory requirements for other existing federally required targets. This is in part because a requirement in the proposed rule in this docket that targets must call for improvement (regardless of funding levels) has the Federal government playing a dominant role in setting the targets, even though the statute is clear that target setting is vested in each "State." (See 23 USC 150(d).)

Thus, if a final rule were to provide Federal officials a target setting role, states would have to be concerned that FHWA would (now or in the future) add similar requirements to other performance measures (safety, pavement condition, bridge condition, travel time reliability) that

[12] NCHRP Research Report 993: *Managing Performance to Enhance Decision-Making Targets Matter*, Available at: https://www.trb.org/Main/Blurbs/182711.aspx. Accessed on 9/28/2022.

would require states to set improving targets. Improving targets may or may not be achievable depending on many factors, including a state government's policies, trends in the state, the economy, and the level of autonomy the state DOT has to impact activities that could support target attainment. State DOTs have relatively limited ability to influence the three components of the GHG emission metric's calculation, notably vehicle miles traveled (VMT), fuel sales, and emissions factors.

In fact, this NPRM is contrary to FHWA's own guidance on performance management and target setting which states that:

> "*The FHWA strongly discourages the use of aspirational targets. In 23 CFR 490.101, a target is defined as a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period required by FHWA.*
>
> *Setting aspirational targets that are not data-driven, realistic, or achievable does not align with the performance management framework or the stated congressional policy to improve project decision-making through performance-based planning and programming…*"[13]

and

> "*FHWA strongly discourages using aspirational targets or TZD targets for setting annual targets…*
>
> *States and MPOs should ensure their annual targets are data-driven, realistic and achievable. Setting aspirational or TZD targets that are not data-driven, realistic or achievable does not align with performance management framework or the stated congressional policy to improve project decision-making through performance-based planning and programming (23 U.S.C. 150(a))...*
>
> *The Statewide and Metropolitan Transportation Planning Rule (23 CFR Part 450) also requires States and MPOs to take a performance-based approach to planning and programming, linking investment decision-making to the achievement of performance targets in the Statewide Transportation Improvement Program (STIP) and the Transportation Improvement Program (TIP) (23 CFR 450.206 & 23 CFR 450.306). It may be difficult to demonstrate how investments contained in the STIP and TIP link to achievement of targets if the targets are aspirational or not data-driven. This requirement applies to safety targets in addition to other performance areas.*"[14]

For such reasons alone, AASHTO opposes promulgation of the rule in its present form. The rule must be clear that target setting is solely reserved to states, without FHWA setting either a direction, parameters or specifics of the target.

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[13] FHWA Transportation Performance Management Frequently Asked Questions, Target Setting, *Should aspirational targets be used as performance targets?*, available at https://www.fhwa.dot.gov/tpm/faq.cfm. Accessed 9/28/2022.

[14] FHWA Q&A on Safety Performance Measures Final Rule, HSIP Target Setting, *May States or MPOs establish aspirational or Toward Zero Deaths (TZD) annual targets when those targets are not reasonably achievable in the time frame represented by the target (annually) to meet the requirements of the Safety Performance Management (Safety PM) rule?*, available at https://safety.fhwa.dot.gov/hsip/spm/faqs.cfm. Accessed on 9/28/2022.

Second, the NPRM alludes to the possibility of also requiring 8- and 20-year targets. Clearly, this regulatory step goes well beyond existing requirements for other federally-required targets which are 2- and 4-year targets. Again, this leads to concerns that FHWA would (now or in the future) add similar requirements to other performance measures (safety, pavement condition, bridge condition, travel time reliability) that would require states to set 8- and 20-year targets.

Third, calendar year 2021 is not an appropriate baseline year due to the COVID pandemic's impact, reducing VMT significantly in that year. We disagree strongly with FHWA's assertion that 2021 is the most appropriate base year since it is the most recent year for which data will be complete and available. Many states have evidence to show that their systems are still recovering and had not normalized by the end of 2021. In fact, many states see it to be probable that near-term VMT will continue to rebound closer to pre-pandemic levels, setting states up to struggle to meet targets that are not objectively reflective of ongoing system performance. AASHTO would recommend FHWA evaluate different options for a baseline year and assess what the impacts may be on state DOT target achievement. Though we note that 2022 would be a far more appropriate baseline year than 2021 as would 2019.

Finally, in the NPRM, FHWA makes reference to 23 CFR 1.36, where FHWA has the authority to hold or reduce federal funds based on the agency's assessment of a state DOT's failure to comply with a federal law or regulation (See 87 Federal Register at 42415). First, 23 CFR 1.36 speaks to violating statues or rules under "this part" referring to 23 CFR Part 1. This is not a Part 1 rule. Second, while this rule itself does not apply a penalty for a state's failure to reach the goal, that apparently is because of FHWA's claims it has authority, as noted above. AASHTO strongly opposes any aspect of a penalty associated with target achievement. Third, this rule has potential to impact a state DOT's overall federal program and require extensive changes to the transportation system to achieve. Trying to reduce GHG emissions to net zero by 2050 (beyond just measuring fuel sales and vehicle miles traveled) would require extensive investments well beyond the NHS network proposed in this NPRM that any state DOT has any authority over. AASHTO opposes promulgation of a final rule that does not clearly provide that no penalties may be imposed on a state for failure to achieve a target under this rule. We take the same position as to other performance targets but we emphasize it as applied to this proposal because FHWA has raised in this docket the possibility of penalties by applying other authorities to performance management.

5) RURAL STATE DOTS WILL HAVE SIGNIFICANTLY DIFFERENT ABILITIES TO AFFECT THE PERFORMANCE METRIC

Each state DOT will face different challenges and opportunities when it comes to identifying strategies and tactics that will directly affect the proposed performance metric. More specifically, rural states and areas will face challenges with identifying strategies and tactics a state DOT can implement to affect the GHG level as measured by FHWA's performance metric. States with growing populations will also face challenges as the strategies and tactics available to state DOTs may become moot as an urban area continues to grow in population. And, states that are both rural and growing will likely have the largest challenge of all.

Rural states have few options to reduce on-road CO_2 emissions for many of the reasons stated in Section 2. However, the paucity of options will likely be more acute in rural than in urban areas.

An example is the state of Montana where the vast majority of the state is extremely rural. The non-NHS public roads in Montana accounted for 94 percent of all public roadway miles and 46 percent of all vehicle miles traveled in 2021. This means the ratio of NHS VMT to Total VMT was 0.543 in 2021. Out of Montana's approximately 74,000 public road miles, 72 percent (~54,000 miles) are unpaved. Additionally, Montana's mountainous terrain and harsh winters make the long distances between destinations even longer and slower to traverse than in other more urbanized states. Over 80 percent of the rural portions of the NHS in Montana have high speed limits (70-80 mph) and little to no congestion. When taken together, these facts indicate that in rural states like Montana where the majority of the NHS system has high speeds and little congestion, yet the vast majority of public road miles (non-NHS) have slower travel speeds, more variable terrain, and poorer conditions than the NHS, the assumption that emissions rates between NHS and non-NHS facilities will be similar is flawed.

Utah is different than Montana, however, since it is both a rural and growth state. Utah is one of the fastest growing states in the nation with a population growth projection of 14 percent by 2030 and 66 percent in the next 40 years. As proposed the GHG emissions performance metric does not account for population growth which would obscure many of the emissions improvements made in states with high population growth such as Utah. Approximately 10 percent of Utah's population lives in rural areas. Rural residents need to drive further to access essential goods and services and on average drive 10 miles more per day than urban residents. Reduction of distances driven to goods and services in rural areas or the broad availability of other modes to access these would likely be associated with increases in population.

Clearly, the kinds of changes that could help a rural state reduce CO_2 emissions and meet declining targets (e.g., increased urbanization, paving of thousands of miles of unpaved roads, lower emissions from new vehicles, and zero direct emissions from EVs) are not or at least largely not in a rural state's control. This calls into question the appropriateness of the proposed required declining GHG emissions targets and the possibility raised by FHWA of imposing penalties on states for not meeting targets.

6) THE PROPOSED RULE RESTS ON A FOUNDATION THAT SIGNIFICANTLY UNDERESTIMATES THE COST

AASHTO has concerns regarding the cost of this proposed rule from three different perspectives:

1) Direct Cost to the State DOT
2) Opportunity Costs Associated with Target Achievement
3) Unintended Costs to the Transportation Program

First, the direct costs to the state DOT include the resources (staff time, consultant, modeling tools and data collection) to implement the requirements of the proposed rule. FHWA conducted an analysis of the costs of this rulemaking and determined that the costs associated with implementing the requirements of the GHG NPRM to be one state employee working 208 hours to establish GHG Targets with 108 hours per year allocated to adjusting those targets per Section 490.105. Given the significant experience of state DOTs in implementing many other FHWA performance management regulations, this estimate is greatly underestimated and does not include other costs associated with acquiring data and systems that will be needed to establish, maintain, and refine any models and long-term monitoring.

It is important to note that experience shows that over time, the benefits of implementing an effective transportation performance management program are significant but will likely outweigh the costs. However, AASHTO believes that the benefits will be derived not solely from a national-level program but also from state and local performance measures and related actions. As proposed, the GHG emissions performance measure will not be sufficient for making program- and project-level investment decisions. FHWA has stated that the purpose of this performance measure is to support better decision-making as the state DOTs work to provide a transportation system that reduces the overall environmental impact. The measures proposed by FHWA, however, while providing a general estimate of GHG emissions for a limited portion of the roadway transportation system, are not likely to lead directly to meaningfully improved decision-making by states. More robust, detailed, and comprehensive models will need to be developed that better represent the broad nature of transportation GHG emissions. Colorado DOT is taking on a promising effort and could be used as a model for other state DOTs that want to conduct and implement a more robust GHG emissions modeling program.

Second, there are opportunity costs associated with GHG performance metric target achievement. There is the opportunity cost associated with doing nothing when, clearly, the climate is changing and having an effect on the transportation infrastructure. Weather events are causing the transportation infrastructure to fail or become unusable for certain periods of time. And, state DOTs are having to determine how to make the transportation infrastructure more resilient. State DOTs do not have unlimited funds, and critical decisions will have to be made regarding which projects to fund and not fund. States will have to balance meeting the required targets set forth under this proposed rule with achieving other targets established for safety, asset condition, and system performance. The regulatory impact analysis does not provide an estimate as to what it would cost a state DOT to achieve measurable progress towards either the medium-(2030) or long-term (2050) goal and AASHTO is concerned that the cost to plan and construct the infrastructure necessary as assumed in the NPRM would be many times beyond today's spending authorities.

Third, there are significant costs to the transportation program in the way surface transportation is set up which is currently largely based upon a per gallon local, state, or federal fuel tax. Such taxes fund not only roadways, but transit as well. If the tactics discussed previously are successful, then there are significant concerns about how to fund the transportation system that must be addressed. In other words, to the extent the surface transportation system reduces use of vehicles utilizing traditionally taxed fuels, then we also must establish a different revenue model that is not based upon the burning of fossil fuels.

7) COORDINATION WITH MPOS AND OTHER AGENCIES

The NPRM does not appropriately address the coordination that will be required among the state DOTs, MPOs, and other agencies. The coordination required will result in a more costly process (see Section 6), requiring more time (see Section 3), with very mixed results on meaningful impact on the performance measure (see Section 2). As mentioned in Section 3, Arkansas DOT

will have to coordinate with a minimum of twelve separate entities, excluding locals, to establish a coordinated target in the urbanized areas. Other state DOTs will have to do the same.

Currently there are 409 MPOs with 369 residing in a single state and 39 crossing over between at least two states. The NPRM proposes that each of these 409 MPOs establish a target for the proposed GHG performance measure regardless of the amount of NHS that runs through the urbanized area. AASHTO would question the need for such a requirement for most MPOs that are small and medium in size and likely do not have the technical staff and resources available to conduct the necessary work. AASHTO would recommend limiting the requirement for a separate target only to those MPOs and urbanized areas based upon existing criteria such as those of a certain size, perhaps of 1 million or greater population.

AASHTO is also concerned about the coordination requirements between the state DOT and MPO for establishing the GHG emissions target. State DOTs are required to use the performance metric proposed in the NPRM which are based upon fuel sales, emissions factors, and NHS mileage. However, MPOs have the option of using a different calculation methodology which is agreed to by both the state DOT and the MPO. Again, AASHTO recognizes that many of the larger MPOs may have sufficient technical expertise, models, data, and tools to estimate GHG emissions. Given this, there is significant uncertainty regarding how a state DOT and MPO will coordinate and differentiate targets that are statewide versus just an urbanized area. Even if an MPO wished to use the performance metric proposed by FHWA, the fuel sales data is not readily available at a county/local level.

AASHTO RESPONSE TO FHWA REQUESTS

Establishing Targets That Lead to Improved Environmental Performance

1. *FHWA encourages comments that address whether the proposed measure would support those national policies [GHG emissions reductions of 50 to 52 percent below 2005 levels by 2030 and for the U.S. to achieve net-zero emissions by 2050.], the ways in which the proposed measure would do so or why it would not, and whether the final rule should contain any other provisions to better support those national policies.*

The two proposed medium- and long-term goals (GHG emissions reductions of 50 to 52 percent below 2005 levels by 2030 and for the U.S. to achieve net-zero emissions by 2050, respectively) are seen as *de facto* targets that all state DOTs must achieve. AASHTO supports a data-driven target setting process with targets set and established by state DOTs. See Section 4, FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting.

2. *FHWA encourages comments on how to structure improving targets for the GHG measure, as well as the associated reporting and significant progress requirements in 23 CFR Part 490, Subpart A.*

AASHTO supports a data-driven target setting process with targets set and established by state DOTs. State DOTs should be able to establish targets that show a decline, improvement, or performance holding steady. See Section 4, *FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting*.

3. *Are there any specific ways the proposed GHG measure could be implemented within the framework of TPM to better support emissions reductions to achieve national policies for reductions in total U.S. GHG emissions?*

AASHTO is not able to provide a detailed response to this request at this time.

4. *What changes to the proposed measure or its implementation in TPM could better the impact of transportation decisions on CO2 emissions, and enable States to achieve tailpipe CO2 emissions reductions necessary to achieve national targets?*

AASHTO provided a comprehensive analysis of the ability of state DOTs to have an effect on the proposed performance metric, see Section 2, G*HG Performance Metric as Proposed can be Readily Calculated But is Hard to Manage*. AASHTO supports a data-driven target setting process with targets set and established by state DOTs. State DOTs should be able to establish targets that show a decline, improvement, or performance holding steady. See Section 4, *FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting*.

5. *In instances that MPOs are establishing a joint urbanized area target, should FHWA require that the individual MPO-wide targets be the same as the jointly established urbanized area target?*

AASHTO provided comments on this question in Section 7, *Coordination with MPOs and Other Agencies*.

6. *Should MPOs that establish a joint urbanized area target be exempt from establishing individual MPO-level targets, and instead only be required to adopt and support the joint urbanized area target?*

AASHTO provided comments on this question in Section 7, *Coordination with MPOs and Other Agencies*.

7. *In cases where there are multiple MPOs with boundaries that overlap any portion of an urbanized area, and that urbanized area contains NHS mileage, should each of those MPOs establish their own targets, with no requirement for a joint urbanized area target?*

AASHTO provided comments on this question in Section 7, *Coordination with MPOs and Other Agencies*.

8. *Are there other approaches to target setting in urbanized areas served by multiple MPOs that would better help MPOs reach net-zero emissions?*

AASHTO supports a data-driven target setting process with targets set and established by state DOTs or, as appropriate, by MPOs. As with State DOTs, MPOs should be able to establish targets that show a decline, improvement, or performance holding steady. See Section 4, *FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting*.

Summary of and Request for Comments on the Regulatory Impact Analysis

1. *The RIA includes assumptions regarding the applicability, level of effort and frequency of activities under proposed Sections 490.105, 490.107, 490.109, 490.511, and 490.513. Are these assumptions reasonable? Are there circumstances that may result in greater or lesser burden relative to the RIA assumptions?*

AASHTO provided more detailed comments to these questions in Section 6, *The Proposed Rule Rests on a Foundation that Significantly Underestimates the Cost*.

2. *Would the staff time spent implementing this measure reduce the burden of carrying out other aspects of State DOT and MPO missions, such as forecasting fuel tax revenues? If so, please describe and provide any information on programs that would benefit from this measure and estimate any costs that would be reduced by implementing this measure.*

As discussed in Section 6, *The Proposed Rule Rests on a Foundation that Significantly Underestimates the Cost*, AASHTO does not believe this rule will reduce the burden of carrying out other aspects of state DOT missions. More likely, this will increase the amount of resources needed.

3. *Would the proposed rule result in economies of scale or other efficiencies, such as the development of consulting services or specialized tools that would lower the cost of implementation? If so, please describe such efficiencies and provide any information on potential cost savings.*

AASHTO discussed in more detail in Section 2, *GHG Performance Metric as Proposed can be Readily Calculated but is Hard to Manage* the creation of the AASHTO State-Level Transportation GHG Calculator, an Excel-based tool that state DOTs can use to estimate the GHG emissions for their state. However, this type of sketch-planning tool would likely not be sufficient to identify specific projects or programs to be implemented. As discussed in Section 6, *The Proposed Rule Rests on a Foundation that Significantly Underestimates the Cost*, a number of states are developing robust decision-making processes to support project and program-level decisions. The NHCRP report *Reducing Greenhouse Gas Emissions: A Guide for State DOTs* also provides a number of tools and resources a transportation agency could use to help implement GHG reduction strategies.[15]

As we saw with implementation of the broader national performance management framework program, there were a number of specialized tools and consulting services created to assist state DOTs and MPOs in responding to the requirements. For example, AASHTO has the Transportation Performance Management Technical Service Program that state DOTs can join to get access to the University of Maryland CATT Lab PM3 reporting tool. Similarly, this new GHG emissions performance metric requirement would likely create the demand for more consulting services and specialized tools to support state DOTs and MPOs in implementation of the requirements.

4. *Would the proposed rule result in the qualitative benefits identified in the RIA, including more informed decision-making, greater accountability, and progress on National Transportation Goals identified in MAP-21? Would the proposed rule result in other benefits or costs? Would the proposed measure change transportation investment decisions and if so, in what ways? For state DOTs and MPOs that have already implemented their own GHG measure(s), FHWA welcomes information on the impact and effectiveness of their GHG emissions measure(s).*

[15] NCHRP Web-only Resource: Reducing Greenhouse Gas Emissions: A Guide for State DOTs available at https://crp.trb.org/nchrpwebresource1/. Accessed 9/28/2022.

AASHTO discussed in more detail the concerns of using the proposed GHG emissions performance metric to support the decision-making process in Section 2, *GHG Performance Metric as Proposed can be Readily Calculated but is Hard to Manage*. All state DOTs are already broadly aware which kinds of programs and projects will affect CO_2 emissions. Thus, the FHWA theory that the proposed rule would increase state awareness of GHG emissions consequences of investment choices is, at best, greatly overstated. What does not seem to be appreciated is that the proposed requirement of declining targets down to greatly reduced CO_2 levels can foreseeably pressure states to change project selection to pick projects estimated to be associated with lower GHG emissions over projects with perceived greater transportation benefits in terms of safety, throughput and connectivity, for example.

Further, FHWA, in the RIA and more generally, must note the overall policies articulated by Congress for title 23 and not read national goals for performance management in isolation. See for example, 23 USC 101(b), Declaration of Policy, where Congress clearly states at 101(b)(3)(D) that --

> *among the foremost needs that the surface transportation system must meet to provide for a strong and vigorous national economy are safe, efficient, resilient, and reliable-*
>
> *(i) national and interregional personal mobility (including personal mobility in rural and urban areas) and reduced congestion;*
>
> *(ii) flow of interstate and international commerce and freight transportation; and*
>
> *(iii) travel movements essential for national security;*

FHWA must consider transportation environmental issues together with, not separate and apart from, important issues of advancing economic growth and improved mobility for people and freight.

490.105 Establishment of performance targets.

1. *FHWA requests comment on what the due date should be in the event a final rule is not effective in advance of the October 1, 2022, reporting date.*

AASHTO opposes a proposed retroactive effective date of October 1, 2022, as comments in this docket are not even due until October 13, 2022.

AASHTO discussed in more detail a recommended implementation date in Section 3, *Develop a Realistic Implementation Timeline*. AASHTO recommends an effective data that would require states to set and report on a two-year target beginning October 1, 2024 is the best compromise between implementing on October 1, 2023 and waiting for the next four-year performance period.

2. *FHWA encourages submission of comments on the type of target setting requirements that would best help MPOs improve the environmental performance of their transportation systems with respect to GHG emissions.*

AASHTO supports a data-driven target setting process with targets set and established by state DOTs or, as appropriate, by MPOs. As with state DOTs, MPOs should be able to establish targets that show a decline, improvement, or performance holding steady. See Section 4, *FHWA Must Continue to Confirm State Authority and Discretion in Target Setting and Reporting*.

3. *FHWA encourages submission of comments on the important issue of how targets established by State DOTs and MPOs for reduced emissions might be implemented in order to lead to improved environmental performance.*

As explained above in Section 2, *GHG Performance Metric as Proposed can be Readily Calculated but is Hard to Manage*, so much of what can lead to reduced CO_2 emissions is outside of the control of state DOTs. State efforts to achieve reduced levels of GHG emissions will benefit from CO_2 reductions that follow from some key decisions outside of state control, such as the mix of new vehicles for sale, particularly the extent to which they are EVs, hybrid vehicles, or more fuel efficient vehicles with internal combustion engine vehicles. In addition, states have options to consider projects that will reduce congestion, such as for better timed and synchronized traffic lights, adding turn lanes at intersections, in some cases adding through travel lane capacity and in other cases the possibility of transfer of some highway funds to transit in densely populated areas. And, state DOTs can serve as a facilitator and convener on the topic of reducing GHG emissions. Many of these projects and programs will have to compete with others that may have other types of benefits.

490.107 Reporting on performance targets.

1. *FHWA requests comment on whether MPOs should be required to provide the metric calculation method and their tailpipe CO_2 emissions to the State DOT outside of the system performance report to provide for more frequent information sharing.*

As discussed in Section 7, *Coordination with MPOs and Other Agencies*, state DOTs and MPOs will have to coordinate on the development of the targets associated with the GHG emissions performance metric and implementation of the projects and programs that will **affect the** metric. At this time, AASHTO and the state DOTs are not sure the full extent of what will be required (e.g., model outputs, data, time for meetings/discussions, etc.). AASHTO is concerned that the cost of this coordination has not been effectively documented in the Regulatory Impact Analysis (Section 6, *The Proposed Rule Rests on a Foundation that Significantly Underestimates the Cost*).

2. *FHWA also requests comment on whether to specify a uniform metric calculation method for MPOs, as opposed to allowing a range of approaches that are referenced in the description of § 490.511.*

AASHTO is not able to provide a detailed response to this request at this time specific to a uniform GHG emissions performance metric for MPOs.

However, with respect to performance measurement in general, it is important to ensure consistency in the definitions and how the metrics are being calculated. One of the benefits of the national performance management framework is a consistent methodology in calculating safety, asset, and system performance. For example, prior to having a uniform definition of "Pavement in Good Condition", states had been measuring it differently. The national performance management framework created consistency in how all states are now measuring pavement performance among other performance measures.

490.509 Data requirements.

1. *FHWA requests comments on any U.S. Government emissions factors or calculation methods that may be useful.*

AASHTO is not able to provide a detailed response to this request at this time. Any emissions factor that is chosen should be authoritative and able to be used by all state DOTs in the GHG emissions performance metric calculation to ensure consistency.

APPENDIX A:
AASHTO Documentation and Analysis of Potential GHG-Reducing Actions

The AASHTO State-Level Transportation GHG Calculator is available for download and use at https://www.tpm-portal.com/collections/ghg-nprm/. The website includes the Excel model, documentation, and input files used for the scenario analysis discussed in these comments.

Questions about the tool can be addressed to:

Matthew Hardy, Ph.D.
Senior Program Director for Planning and Performance Management
AASHTO
mhardy@aashto.org
202-624-3625

Overview

This memorandum presents the draft results of an analysis of predicted Greenhouse Gas Emissions (GHG) made using the AASHTO GHG Calculator. This tool is designed to calculate GHG and National Highway System (NHS) GHG emissions at a state level using an approach similar to that described by the Federal Highway Administration (FHWA) in its draft rule for a new NHS GHG performance measure. The tool predicts future GHG emissions scaling a baseline value based on changes in amount of travel and fuel efficiency.

Predictions of future GHG emissions were made for a set of ten states for five different scenarios. The scenarios illustrate the potential impact of key parameters on future. For each state and scenario, GHG emissions were predicted 1, 5, 10, 20, and 30 years into the future from the baseline date of 2022. Table 1 summarizes the different scenarios and the parameters varied in each.

Table 1: Summary of GHG Analysis Scenarios

Scenario Title	Description	Parameters Varied
Scenario 0: Baseline	VMT growth continues at historic average level, no change mode share or fuel efficiency	*none*
Scenario 1: Electric Vehicles (EV)	All new automobiles sold will be EVs by 2035	*EV % of Automobile Fleet*
Scenario 2: Increased Transit and Work from Home (WFH)	Transit use reverts to 2019 (pre-COVID) levels, and WFH gradually increases back to COVID levels by 2030	*% of Future Work Trips Driving Alone* *% of Future Work Trips Carpooling*
Scenario 3: Reduced Vehicle Miles Travelled (VMT)	Land use and other policy changes occurring by 2040 result in VMT growth limited to population growth by 2050	*Annual VMT Growth*
Scenario 4: Combination	The variable changes from Scenarios 1, 2, and 3 are combined at one half of each of the changed amounts	*All parameters listed above*

The ten states include two each from the Northeast (Maine and Massachusetts), Southeast (Florida and South Carolina), Midwest (Kansas and Minnesota), Southwest (Nevada and Texas), and West (Washington and Wyoming). These states were selected as representative examples from each geographic region.

Methodology

The analysis was conducted by performing 260 runs in the AASHTO State-Level Transportation GHG Calculator, a spreadsheet tool implemented in Microsoft Excel. The tool uses data on fuel consumption and percentage of VMT on the NHS to estimate baseline GHG and NHS GHG

emissions. It predicts future emissions by scaling the baseline value based on changes in VMT and fuel efficiency. Various mutable factors contribute to these changes, such as:

- Annual VMT growth rate
- Percent of VMT attributed to each vehicle type (auto, single-unit truck/bus, combo truck, motorcycle)
- Percent of work trips made driving alone or carpooling
- Fuel efficiency for non-EVs by vehicle type
- Percent of EVs in the fleet by vehicle type

The tool was populated with data from each state. For each state, one calculation estimated the baseline (2022) GHG emissions, and then five runs (one for each analysis period) were conducted for each of the five scenarios, resulting in 26 runs per state.

Future GHG emissions were converted into an index, with the baseline value set equal to 100. The index was calculated as follows.

$$GHG\ Index = \frac{(Future\ Total\ GHG)}{Baseline\ Total\ GHG} * 100$$

The percent of VMT on the NHS was not varied in any of the calculations. Consequently, in all cases, the GHG Index is the same for total GHG and NHS GHG.

The baseline assumptions are as follows:

- The default VMT growth rate was calculated for a state based on the VMT trend from 2010 to 2019 for that state.
- Tool defaults were used for all other parameters for Scenario 0.
- In the tool, state-specific values are determined for % of Work Trips Driving Alone and % of Work Trips Carpooling. Other parameters are populated with national defaults.
- For Scenarios 1 to 4, specific variables were changed as documented in Table 2 and described below.

Year	Scenario 1	Scenario 2		Scenario 3	Scenario 4			
	EV % of Auto Fleet	% of Future Work Trips Driving Alone	% of Future Work Trips Driving Alone	Annual VMT Growth	EV % of Auto Fleet	% of Future Work Trips Driving Alone	% of Future Work Trips Driving Alone	Annual VMT Growth
Florida								
1	2%	78.86%	9.35%	1.61%	1%	77.94%	9.24%	1.62%
5	7%	76.40%	9.06%	1.51%	4%	77.94%	9.24%	1.57%
10	20%	73.33%	8.69%	1.39%	10%	76.40%	9.06%	1.51%
20	70%	73.33%	8.69%	1.15%	35%	76.40%	9.06%	1.39%
30	95%	73.33%	8.69%	0.90%	48%	76.40%	9.06%	1.27%
Kansas								
1	2%	81.78%	9.31%	0.68%	1%	79.91%	9.09%	0.69%
5	7%	79.91%	9.09%	0.58%	4%	81.08%	9.23%	0.64%
10	20%	77.58%	8.83%	0.46%	10%	79.91%	9.09%	0.58%
20	70%	77.58%	8.83%	0.22%	35%	79.91%	9.09%	0.46%
30	95%	77.58%	8.83%	-0.03%	48%	79.91%	9.09%	0.34%
Maine								
1	2%	77.53%	10.26%	0.22%	1%	75.01%	9.92%	0.23%
5	7%	75.01%	9.92%	0.12%	4%	76.59%	10.13%	0.18%
10	20%	71.86%	9.51%	0.00%	10%	75.01%	9.92%	0.12%
20	70%	71.86%	9.51%	-0.24%	35%	75.01%	9.92%	0.00%
30	95%	71.86%	9.51%	-0.49%	48%	75.01%	9.92%	-0.12%
Massachusetts								
1	2%	69.95%	7.59%	1.96%	1%	65.22%	7.08%	1.97%
5	7%	65.22%	7.08%	1.86%	4%	68.17%	7.40%	1.93%
10	20%	59.30%	6.44%	1.74%	10%	65.22%	7.08%	1.86%
20	70%	59.30%	6.44%	1.50%	35%	65.22%	7.08%	1.74%
30	95%	59.30%	6.44%	1.26%	48%	65.22%	7.08%	1.62%
Minnesota								
1	2%	77.27%	8.65%	0.76%	1%	74.31%	8.32%	0.77%
5	7%	74.31%	8.32%	0.66%	4%	76.16%	8.52%	0.72%
10	20%	70.62%	7.90%	0.54%	10%	74.31%	8.32%	0.66%
20	70%	70.62%	7.90%	0.29%	35%	74.31%	8.32%	0.54%
30	95%	70.62%	7.90%	0.05%	48%	74.31%	8.32%	0.41%

Nevada								
1	2%	77.38%	10.61%	2.91%	1%	74.92%	10.27%	2.92%
5	10%	74.92%	10.27%	2.81%	5%	76.46%	10.48%	2.87%
10	20%	71.83%	9.84%	2.69%	10%	74.92%	10.27%	2.81%
20	70%	71.83%	9.84%	2.44%	35%	74.92%	10.27%	2.69%
30	95%	71.83%	9.84%	2.20%	48%	74.92%	10.27%	2.57%
South Carolina								
1	2%	82.37%	9.32%	1.83%	1%	80.63%	9.12%	1.84%
5	10%	80.63%	9.12%	1.73%	5%	81.72%	9.25%	1.79%
10	20%	78.45%	8.88%	1.61%	10%	80.63%	9.12%	1.73%
20	70%	78.45%	8.88%	1.36%	35%	80.63%	9.12%	1.61%
30	95%	78.45%	8.88%	1.12%	48%	80.63%	9.12%	1.49%
Texas								
1	2%	79.84%	10.58%	2.32%	1%	77.86%	10.32%	2.33%
5	10%	77.86%	10.32%	2.22%	5%	79.10%	10.49%	2.28%
10	20%	75.39%	10.00%	2.10%	10%	77.86%	10.32%	2.22%
20	70%	75.39%	10.00%	1.86%	35%	77.86%	10.32%	2.10%
30	95%	75.39%	10.00%	1.61%	48%	77.86%	10.32%	1.98%
Washington								
1	2%	71.36%	10.14%	0.97%	1%	67.58%	9.60%	0.98%
5	10%	67.58%	9.60%	0.87%	5%	69.95%	9.93%	0.94%
10	20%	62.85%	8.93%	0.75%	10%	67.58%	9.60%	0.87%
20	70%	62.85%	8.93%	0.51%	35%	67.58%	9.60%	0.75%
30	95%	62.85%	8.93%	0.27%	48%	67.58%	9.60%	0.63%
Wyoming								
1	2%	76.30%	10.61%	0.94%	1%	73.61%	10.23%	0.95%
5	10%	73.61%	10.23%	0.84%	5%	75.29%	10.47%	0.90%
10	20%	70.26%	9.77%	0.72%	10%	73.61%	10.23%	0.84%
20	70%	70.26%	9.77%	0.48%	35%	73.61%	10.23%	0.72%
30	95%	70.26%	9.77%	0.23%	48%	73.61%	10.23%	0.60%

Scenario 1: Electric Vehicles

In Scenario 1, it is assumed that by 2030, all automobiles sold in the US will be EVs. Thus, the percent of autos that are EVs gradually increases over time, as automobiles are replaced. Note that in this scenario no changes are made for fuel efficiency for trucks.

Estimates for the percent of EVs in the automobile fleet are determined using the model described in "Decarbonizing US passenger vehicle transport under electrification and automation uncertainty has a travel budget" and interpreted in "Electric Cars Are Coming. How Long Until They Rule the Road?" Based on these sources, the estimated percent of the auto fleet that is EV is as follows:

- Year 1: 2%
- Year 5: 7%
- Year 10: 20%
- Year 30: 95%

For purposes of this exercise, the rate of EV adoption is assumed to be the same for each state analyzed. However, we do acknowledge that the reality will be different adoption rates for many different reasons.

Scenario 2: Increased Transit and Work from Home

In this scenario, it is assumed that there will be a long-term shift in work trips away from automobiles towards other modes. Specifically, it is assumed that by 2032, approximately 22.5% of work trips nationally will be made by non-automobile modes (transit, bicycle/pedestrian, or working from home). This is consistent with a scenario in which transit use reverts to 2019 levels, and working from home trends upwards toward the level observed in late 2021, at which time an estimated 13% of workers were teleworking fulltime and an additional 9% were teleworking part-time.

To obtain values for each state, the state-level values for % workers driving along and % carpooling were adjusted to achieve the target value nationally.

Scenario 3: Reduced Vehicle Miles Traveled

In this scenario, it is assumed that a combination of different policies and development strategies would result in a reduction of the overall VMT growth rate over a 30-year period to a value of 0.36% (the future annual population growth rate estimated for the US by the UN). The 0.36% value is assumed to be a national average. The VMT growth rate for each state was adjusted relative to the baseline value so that this national average is achieved over a 30-year period.

Scenario 4: Combination

This scenario is a combination of the three previous scenarios. It assumes that each of the effects laid out in the first three scenarios is halved. Thus, the percent of EVs is half the amount in Scenario 1, the increase factor applied to non-auto work trips is half the value used in Scenario 2, and the total change in VMT is half that used in Scenario 3.

Results

The state-by-state results are illustrated below in Figures 1 to 10. Each figure shows results by year for each of the scenarios for a selected state. Results are shown in terms of the GHG Index, with the baseline GHG Index equal to 100.

Figure 1. Predicted GHG Index Over Time by Scenario: Florida

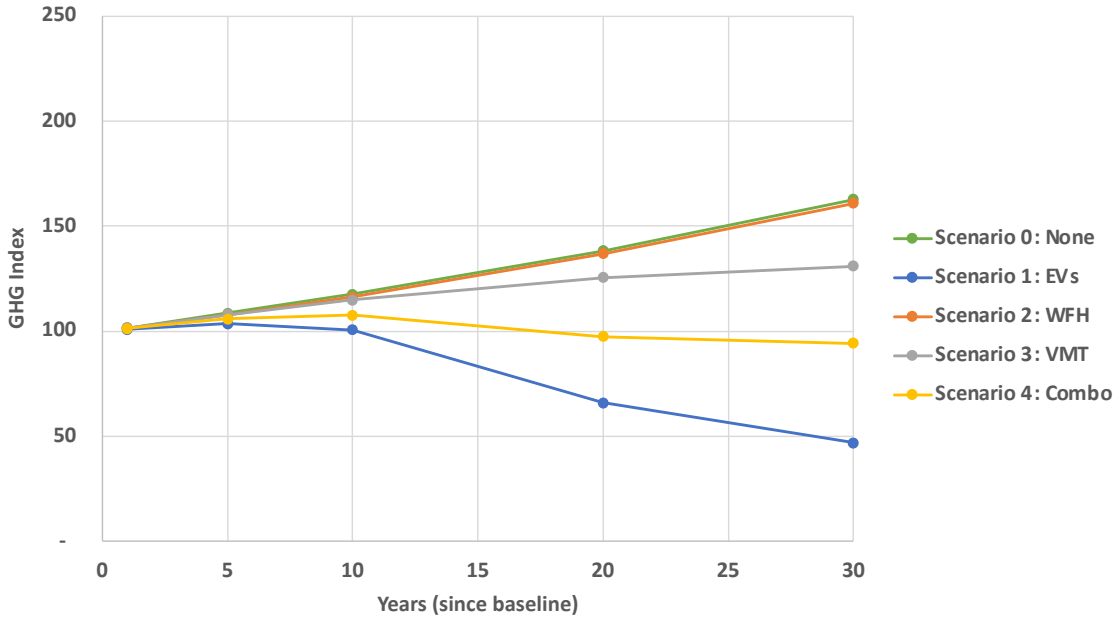


Figure 2. Predicted GHG Index Over Time by Scenario: Kansas

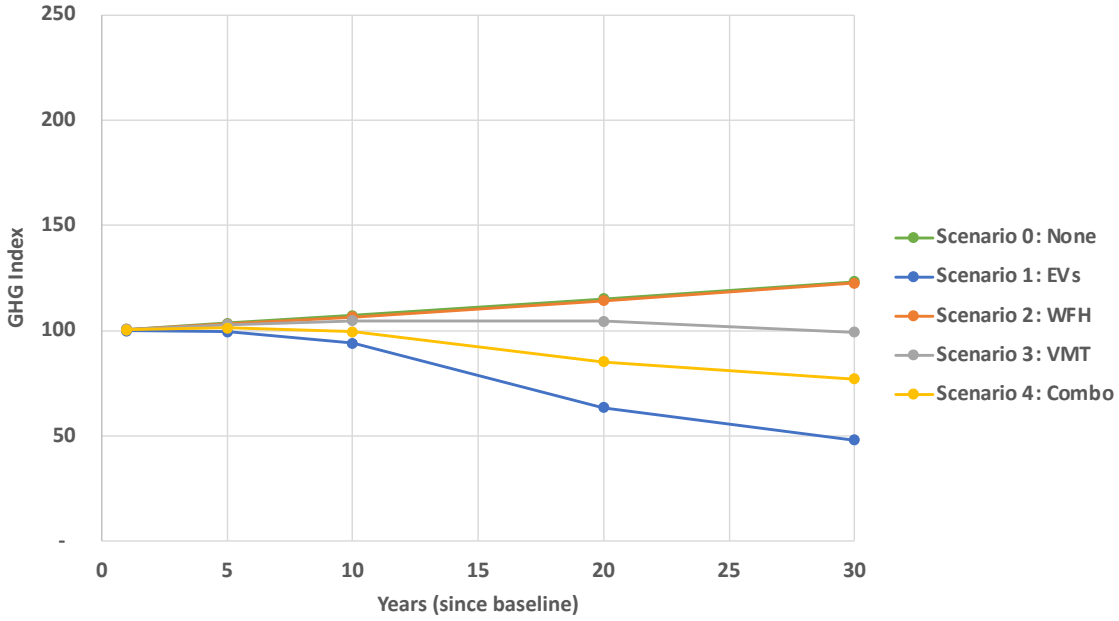


Figure 3. Predicted GHG Index Over Time by Scenario: Maine

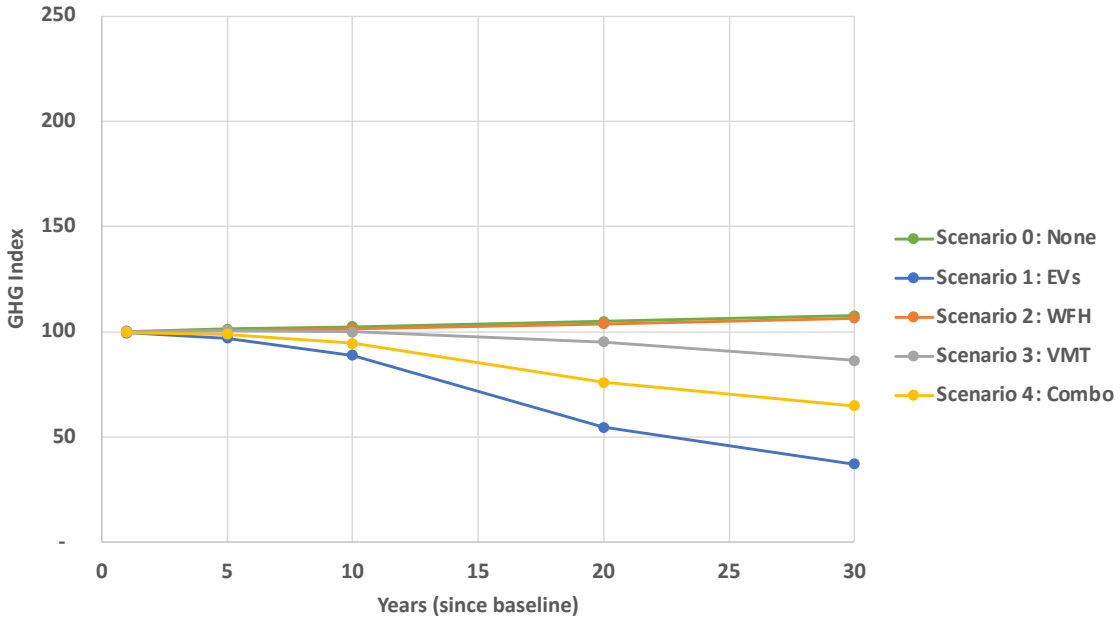


Figure 4. Predicted GHG Index Over Time by Scenario: Massachusetts

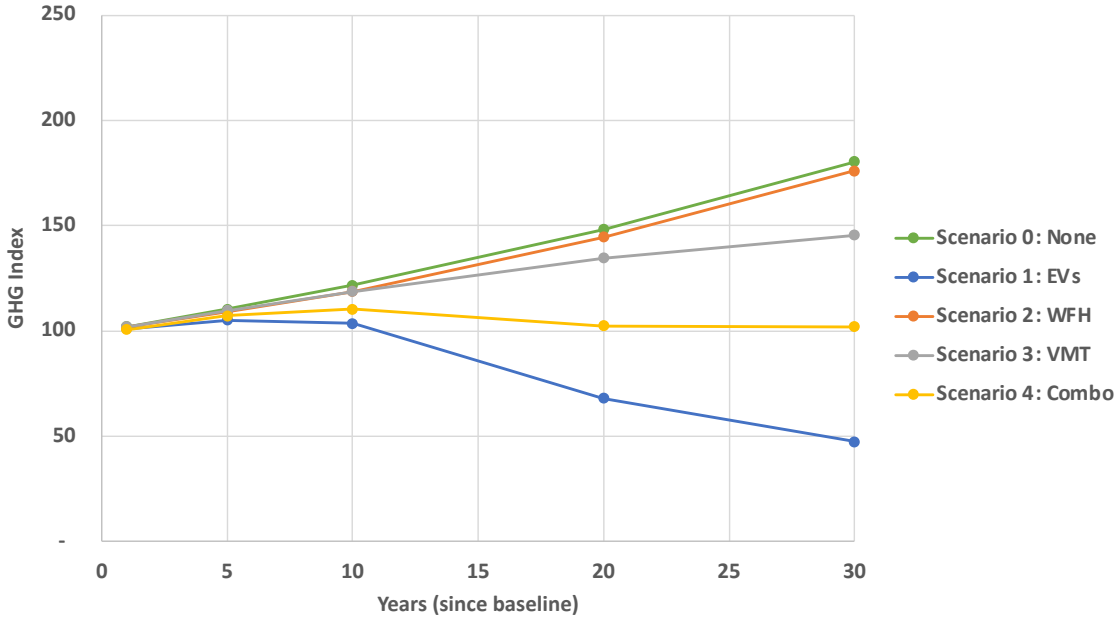


Figure 5. Predicted GHG Index Over Time by Scenario: Minnesota

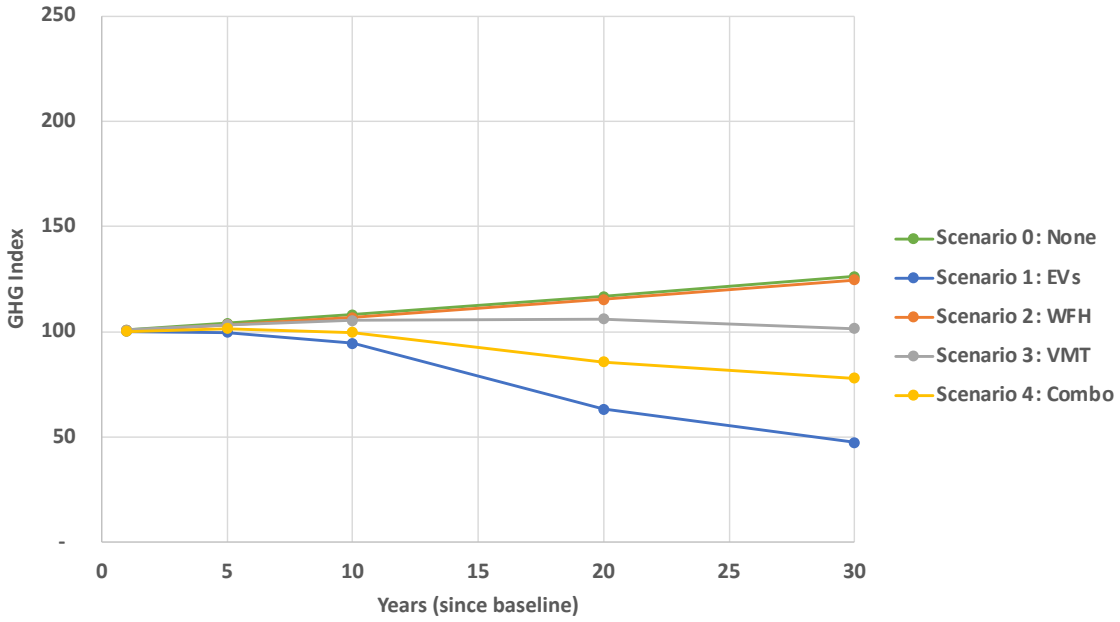


Figure 6. Predicted GHG Index Over Time by Scenario: Nevada

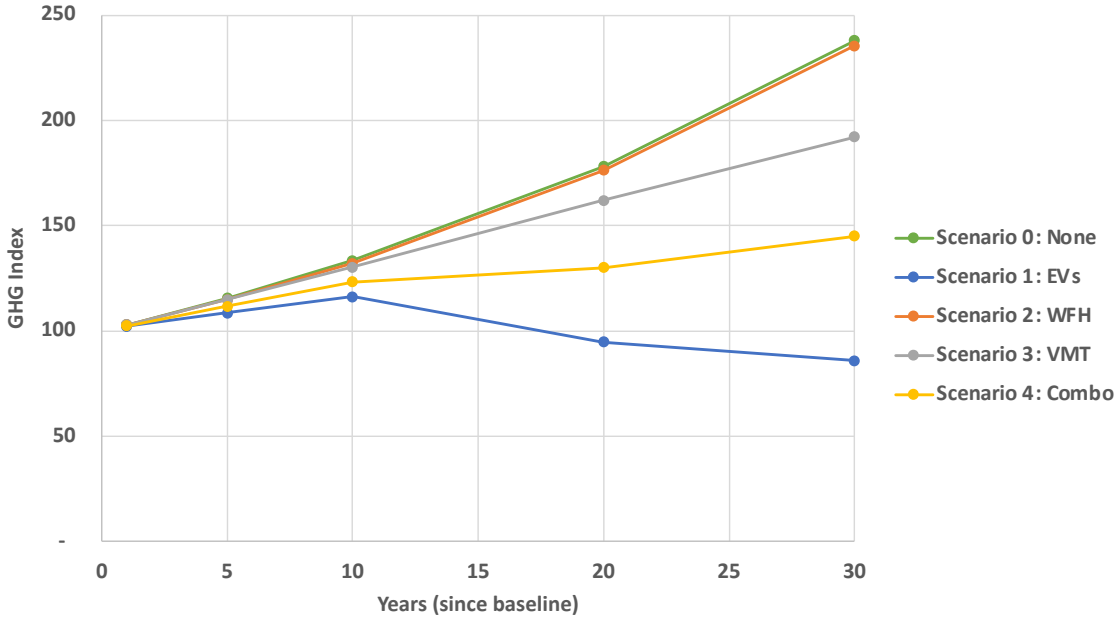


Figure 7. Predicted GHG Index Over Time by Scenario: South Carolina

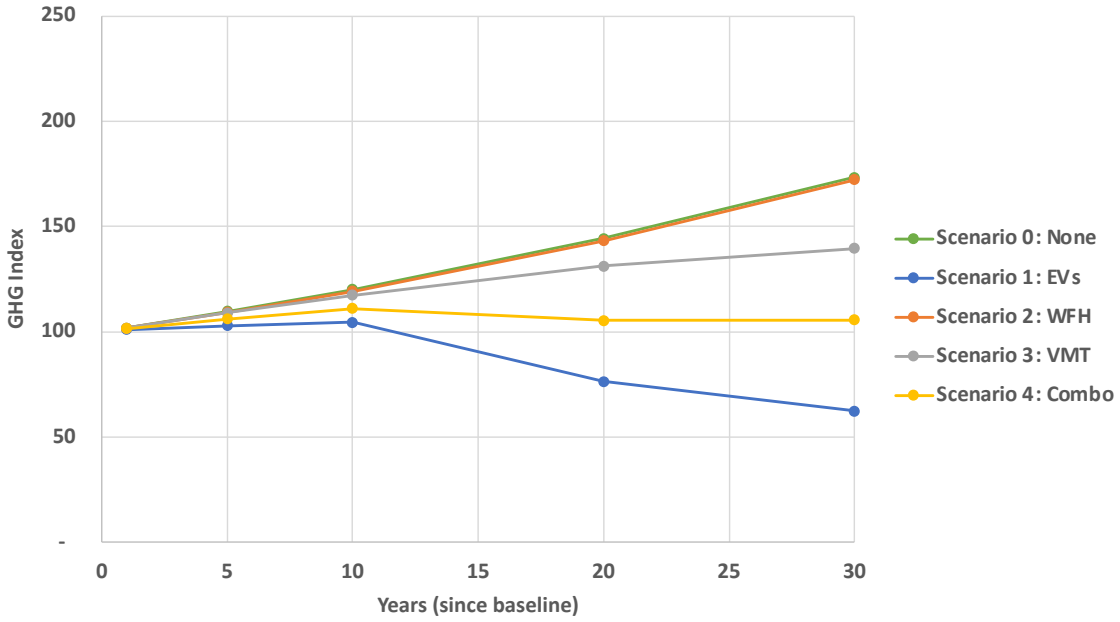


Figure 8. Predicted GHG Index Over Time by Scenario: Texas

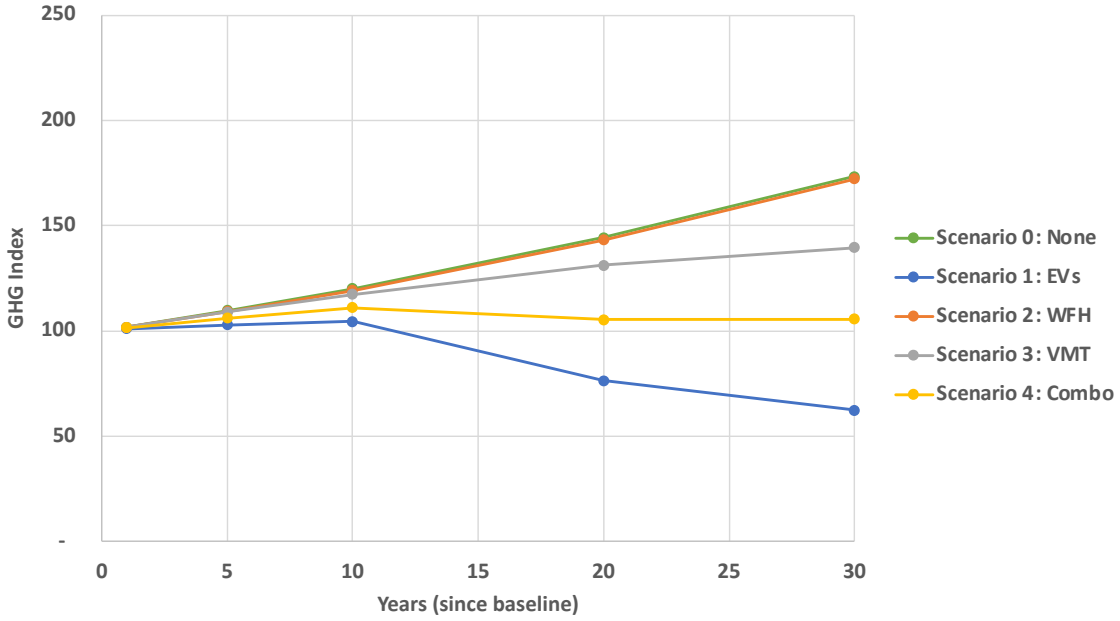


Figure 9. Predicted GHG Index Over Time by Scenario: Washington State

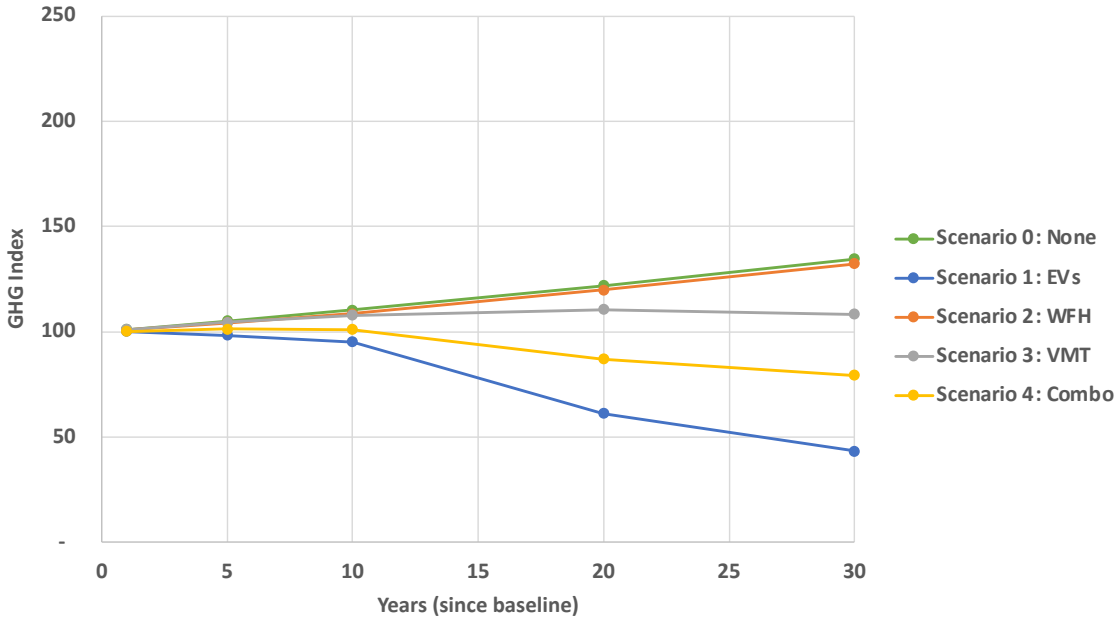
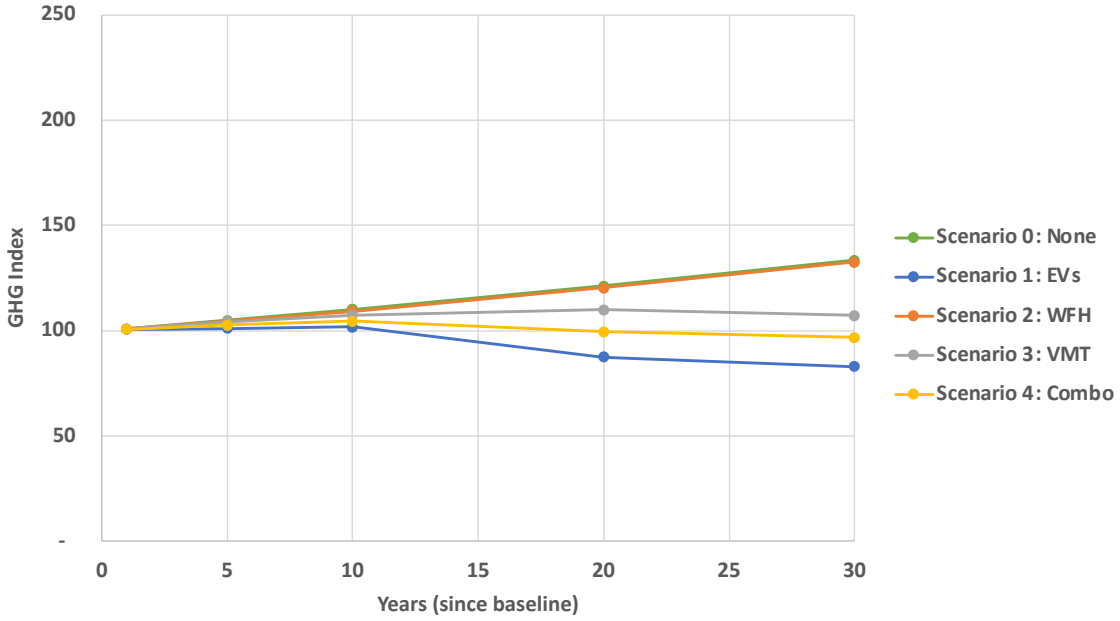


Figure 10. Predicted GHG Index Over Time by Scenario: Wyoming



Discussion

In Figures 1 to 10, the results for Scenario 0 reflect predicted GHG emissions over time, assuming VMT growth is equal to the rate observed from 2010 to 2019 (1.06% annually at a national level) and there is no improvement in fuel efficiency. In this scenario, emissions grow at a rate equal to VMT growth.

Scenario 2 shows the impact of increasing the percentage of workers working from home or using other modes besides automobiles. In all cases, this results in a reduction in GHG emissions relative to Scenario 0. However, the reduction is relatively small (typically <1%), given only approximately 20% of auto VMT is associated with work trips. Consequently, a 1% reduction in mode share for SOV typically results in a reduction of approximately 0.15% in GHG emissions.

In Scenario 3, annual VMT growth trends downwards, such that by 2030 the growth rate is 0.36% at a national level. In all cases, this results in lower predicted emissions than Scenario 0. Further, in cases where the VMT growth rate was already low (relative to the national average), the further reduction in VMT growth is predicted to reduce VMT compared to the baseline year and lower GHG emissions. Such a reduction is observed for Kansas and Maine.

Scenario 1 shows the impact of transitioning autos to EVs. This consistently yields the greatest reduction in GHG emissions. For most of the states analyzed, the transition to EVs results in a reduction of GHG emissions by more than 50% over a 30-year period. However, the specific reduction depends on assumed VMT growth and the degree to which baseline GHG emissions result from gasoline or special fuels. In states with higher VMT growth (e.g., Nevada) or greater use of special fuels (e.g., Wyoming), transitioning to EVs results in a more modest reduction in GHG emissions. Scenario 4 consistently results in a reduction in GHG emissions greater than that for Scenario 2 but less than that for Scenario 3.

Below are further observations and qualifications regarding the results:

- Where reductions in GHG emissions are predicted, these typically occur over a period of ten or more years. For instance, while the transition to EVs can be expected to result in a reduction of approximately 50% reduction in most of the states analyzed, in the near term, emissions may remain flat or increase given the time it takes for the fleet transition to occur.
- Other parameters may vary over time that were not considered in the sensitivity analysis, such as fuel efficiency for trucks and the distribution of VMT by vehicle type.
- Baseline values for 2022 were assumed to be equal to pre-pandemic (2019) values.
- In reality, there may be complex interactions between different parameters not considered in the analysis or in the calculations performed by the GHG Calculator.
- The analysis described here was performed to test the sensitivity of predictions of future GHG emissions to changes in various parameters, and it is not intended as a substitute for a comprehensive analysis of GHG emissions.