

Memorandum

To: CHAIR AND COMMISSIONERS
CALIFORNIA TRANSPORTATION COMMISSION

CTC Meeting: August 17-18, 2016

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Information Item

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Subject: UPDATE ON MOVING AHEAD FOR PROGRESS IN THE 21st CENTURY ACT (MAP-21)
PERFORMANCE MANEGMENT RULEMAKINGS

SUMMARY:

The Moving Ahead for Progress in the 21st Century Act (MAP-21) directs the U.S. Secretary of Transportation to establish performance measures related to statutory national performance goals for safety, infrastructure condition, freight movement, environmental sustainability, and other areas (23 U.S.C. § 150). State Departments of Transportation (DOTs) and other Federal-Aid Highway grantees are expected to set and maintain targets based on the U.S. Department of Transportation-defined (U.S. DOT) performance measures, collect data, and report to U.S. DOT their progress in meeting these targets. Ultimately, these performance measures and targets are intended to influence Federal-Aid Highway planning, programming, and spending decisions in furtherance of national goals.

The U.S. DOT performance management effort has been primarily comprised of four major rulemakings:

- **Performance Management 1** – Safety Performance Measures/Highway Safety Improvement Program;
- **Performance Management 2** – National Highway Performance Program Pavement and Bridge Condition Performance Measure; and
- **Performance Management 3** - National Highway System Performance, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program.
- Additionally, a rulemaking on “**Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning**” provides the framework for State DOTs and Metropolitan Planning Organizations (MPOs) to coordinate with each other and incorporate performance-based decision making into the planning and programing process.

In 2014, U.S. DOT began publishing performance management notices of proposed rulemaking (NPRMs). To date, only two of these rules have been finalized: “Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning” and “Performance Management 1”. (A schedule of performance management rulemakings can be found in Attachment 1).

Since 2014, the California Department of Transportation (Department) has provided comments for each performance management Notice of Proposed Rulemaking (NPRM), and in each instance, solicited external transportation stakeholder input for its comments through statewide engagement.

In August 2015, the Department hosted a two-day “MAP-21 Performance Management Data Assessment Workshop” in Sacramento to identify data gaps, mitigation measures, and potential policy decisions required to implement performance rules when they are finalized. The Department has also appointed MAP-21 Performance Management Team Leaders who will lead the implementation of each performance management final rule. These Performance Management Team Leaders have led Caltrans’ NPRM analysis and comment drafting process for each of the respective performance management rulemakings.

On July 1, 2016, the Department circulated to stakeholders its draft on the comments for “Performance Management 3”; these comment are located in Attachment 2.

On July 11, 2016, the Department’s Division of Transportation Planning requested that MPO and Regional Transportation Planning Agency Executive Directors provide input for strategies to engage stakeholders in the MAP-21 Performance Management target-setting process. The Department is currently seeking to identify a process for how the State will coordinate and establish performance targets with regard to performance management rules that have been finalized.

On July 14, 2016, the Department hosted a statewide conference call to discuss its draft comments for “Performance Management 3” and requested written feedback. The Department is in the process of internally reviewing its revised draft comments based on stakeholder feedback, and the revised comments will be submitted to the federal register prior to the August 20, 2016 due date.

All information regarding the Department’s activities related to MAP-21, including Performance Management rulemakings and relevant links to U.S.DOT websites, can all be found at the **Caltrans FAST Act/MAP-21 Implementation Website**:

http://www.dot.ca.gov/hq/transprog/map21/map21_implementation.htm

Additionally, the Federal Highway Administration Transportation Performance Management Website includes links to performance management fact sheets, presentations and webinar recordings: <http://www.fhwa.dot.gov/tpm/rule.cfm>

Attachments

Schedule for MAP-21 Notice of Proposed Rulemakings

Rules Related to Performance Management Measures	Federal Agency	Expected Release Date	End of Comment Period	Date of Final Rule	State DOT Targets Due	MPO Targets Due
Performance Management 1: Highway Safety Improvement Program (HSIP) and Safety Performance Measures	FHWA	March 28, 2014	June 30, 2014	March 15, 2016 Effective Date April 14, 2016	August 31, 2017	February 28, 2018
Performance Management 2: Assessing Pavement Condition for the National Highway Performance Program and Bridge Conditional for the National Highway Performance Program	FHWA	January 1, 2015	April 6, 2015	<i>November 30, 2016*</i>	---	---
Performance Management 3: Assessing Performance of the National Highway System (NHS), Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program (CMAQ)	FHWA	April 22, 2016	August 20, 2016	---	---	---
Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning	FHWA and FTA	June 2, 2014	September 2, 2014	May 27, 2016 Effective Date June 27, 2016	June 27, 2017	December 27, 2016

**Anticipated date*

**California Department of Transportation's Comments on the
Federal Highway Administration's Notice of Proposed Rulemaking on the
National Performance Management Measures; Assessing Performance of the
National Highway System, Freight Movement on the Interstate System, and
Congestion Mitigation and Air Quality Improvement Program**

August XX, 2016

Overarching Comments

In California, the focus of measuring system performance and evaluating transportation impacts is trending toward vehicle miles traveled (VMT). Because the proposed federal measures and goals are mainly focused on time reliability and congestion, some system assessments may be in conflict with our state evaluations and direction.

Using the proposed methods to assess highway system performance is resource intense. Federal funding should be provided to support training as well as other required activities such as developing new analysis tools, internal and external coordination efforts, and data analysis. Additional time is also needed to assess trends and develop baselines.

**Subpart E—National Performance Management Measures to Assess Performance of the
National Highway System**

The two proposed measures to assess performance of the Interstate are (1) Percent of the Interstate System providing for Reliable Travel and (2) Percent of the Interstate System where peak hour travel times meet expectations. The two proposed measures to assess performance of the non-Interstate National Highway System (NHS) are (1) Percent of the non-Interstate NHS providing for Reliable Travel and (2) Percent of the non-Interstate NHS where peak hour travel times meet expectations.

As written, the metrics for assessing NHS performance focus on delay and vehicle throughput, which was more suitable in the past as the NHS was being constructed and expanded. However, given the maturity of the network today and the continuous increase in traffic demand each year, many major urbanized regions have acknowledged that it is no longer desirable or sustainable to continue building their way out of congestion. A focus on vehicle travel times and speeds tends to drive system expansion, which has adverse impacts when compared with other alternatives that are supported by other metrics such as VMT. Travel time-based measures should be averaged among modes in order to make sure they are not strictly auto-centric.

Further, using travel time reliability as a metric does not indicate whether or not congestion improvement has taken place, only that the status quo has been maintained (e.g., a 30-minute trip continues to take thirty minutes). Congestion-based metrics should instead measure how human mobility and goods movement in a corridor are balanced across parallel facilities and all modes of transportation and means of conveyance.

Ideally, in light of the growing national concern over greenhouse gas (GHG) emissions from the transportation sector, the performance measures outlined in the NRPM would focus less on delay and more on accessibility and trip-generation based metrics. These types of measures may encourage greater consideration of non-auto travel modes like transit, carpooling, vanpooling, walking, and bicycling measures. Caltrans would prefer to see the focus shift from moving more vehicles along the highway to moving more people along the highway. This comment was also brought up by other stakeholders, as indicated on page 23813 of the Federal Register notice. Even though the Federal Highway Administration (FHWA) acknowledges that is difficult to establish person throughput as a national performance measure due to the limitation of available vehicle occupancy data, FHWA should still consider measurements that would encourage State Departments of Transportation (DOTs) to increase person throughput rather than relying on existing vehicle-oriented metrics.

Overall, Caltrans would like to see more flexibility in the metrics used to assess the performance of the Interstate and non-Interstate NHS. In order to maintain flexibility, states should be allowed to select the measures that are best suited to their needs. States should be allowed to demonstrate how they are achieving federal congestion and air quality targets through their individual strategies that balance a mix of transportation investments and influence over more travel-efficient regional growth patterns. Additionally, State DOT and Metropolitan Planning Organization (MPO) choices of measures should demonstrate the effects of transportation investments on economic growth, efficient land use, environment, and community quality of life, and should support the development of wider choices for addressing congestion.

The biggest challenge in these rules will be developing an analytical system to perform the prescribed measurements. Caltrans currently has an application which is used to assess highway performance in areas with highway detection, as well as purchased sensor data (Caltrans Performance Measurement System, or Caltrans PeMS), which is used in all areas with detection in order to provide a large series of analyses.

Integration of the National Performance Management Research Data Set (NPMRDS) into Caltrans PeMS will be a significant and costly challenge and will require development of analysis tools, along with tools to process the data.

Since FHWA is requiring the same reports of all states using the same data set, Caltrans recommends that they license or develop an analysis tool for all state DOTs and MPOs to use in order to facilitate reporting without requiring all states to either modify their existing analysis tools or develop their own.

The reporting timelines for this rule will be very difficult to achieve if states are left to develop their own analysis tools. California will not have any tools in place by October 2016 to provide the initial analysis on the performance metrics, and it will be difficult to set targets until we have a functional tool and have been able to analyze both current and past data to establish trend information.

- While the proposed measures do establish a metric of performance, they do nothing to address the severity of performance issues in heavily congested areas, only assessing

what percentage of the system falls short of a threshold that has been established. Caltrans focuses heavily on the amount of user delay and VMT, which are not part of the calculations for system performance in this Notice of Proposed Rulemaking (NPRM).

- The metrics look at percentages of the entire system, and are so general that they would not give a very good picture of California and its regions, which vary significantly in performance.
- Caltrans does not have a comment on the 1.5 ratio. However, it is recommended that the use of the measures be limited to urban areas, where the vast majority of operational issues are located.
- California currently calculates travel time reliability metrics based on segment lengths which represent typical user trips, and are five (5) miles and longer. Segment lengths of ½ mile, even in urban areas, break the system down into pieces which are too small. It is recommended that minimum segment lengths be a mile or longer.
- While it is possible to calculate the proposed metrics, they are far too general to show significant progress in a state as large as California. If the NPRM broke the measurements into state-defined corridors of significance, smaller regions, or individual routes, the data would be more applicable to California.
- With regard to data, section 490.103 requirements prevent Caltrans from using our extensive highway detection system in urban areas because it does not cover the entire state highway system or NHS. We would suggest that this rule be relaxed in order for us to use a far more accurate system of sensors to report on performance in urban areas.

Subpart F—National Performance Management Measures to Assess Freight Movement on the Interstate System

The two proposed measures to assess freight movement on the Interstate System are (1) Percent of the Interstate System Mileage providing for Reliable Truck Travel Time, and (2) Percent of the Interstate System Mileage Uncongested.

- The FHWA website lists one of the national goals of this NPRM as “Freight movement and economic vitality - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.” The two proposed metric do not capture the essence of this goal, as they are limited to interstate freight movement only. Because the Interstate system does not capture many critical freight highways and surface streets, the metrics should encompass the proposed National Highway Freight Network instead. In future the entire multimodal freight system should be covered by the proposed metrics.
- The two proposed metrics are too general to provide a good assessment or clear picture of statewide freight system performance, especially in large states with extensive rural

mileage. Therefore, it is difficult to comprehend how the metrics will succeed in signifying progress toward national goal achievement.

- The rulemaking will require an intense commitment of resources to accomplish. Federal funding should be provided to support training as well as other required activities such as integrating existing performance measurement systems with the NPMRDS, developing new analysis tools, internal and external coordination efforts, and data analysis. To ensure consistency and reduce inefficiencies of each state integrating and developing their own analytical tools to be compliant, it is recommend that United States Department of Transportation (U.S. DOT) provide State DOTs and MPOs user-friendly tools and programs to more easily generate the required measures, and to allow the flexibility to use the tools for assessing other levels of performance.
- If the goal is to determine system reliability and congestion performance, it would be more efficient to focus resources on peak periods of freight travel and/or areas with congestion or bottlenecks, not on 24/7 data collection and analysis. If the NPRM broke the roadway measurements into state-defined corridors of significance, smaller regions, or individual routes instead of ½ to 10-mile segments, then the data would be more applicable for California.
- Caltrans is uncertain how well the NPMRDS data reflects freight movements of independent truckers and activity, especially near the California border with Mexico.
- The U.S. DOT should provide best practices and/or a set of negotiating guidelines to use if disagreements occur when determining mutual roadway segments and/or targets.
- Standard speed and reliability thresholds for passenger and freight differ even though vehicles are traveling along the same stretch of roadway. For example, with different goals set for passengers and freight, how will the variances in speed along the same roadway be reconciled? Since calculations for speed and reliability are required for both, it would be more efficient to make calculations using the same thresholds. That being said, having one fixed travel speed as a standard will not account for differences in terrain such as mountainous or costal geography and/or weather events that would influence travel speed.
- System performance and freight reliability percentiles for autos and trucks differ, which infers that although both cars and trucks are traveling along the same interstate, the system for cars would be considered reliable at the 80th percentile, but truck travel would not be considered reliable unless they are at the 95th percentile. This different percentile for autos and trucks is a potential source of conflict.
- Caltrans currently uses a 35 mile per hour (mph) threshold standard to reflect uncongested speed, which differs from the proposed 50 mph threshold freight standard.

Determining how this change would affect system performance, especially in dense urban areas, will require further examination.

- The NPRM indicates that the initial performance report is due October 1, 2016. If the final rule comes out in September 2016, more time is needed to allow State DOTs and MPOs to integrate our system with the NPMRDS, determine reporting segments in coordination with MPOs, establish baselines and meaningful targets, and report on progress toward target performance by the deadline.
- As part of Governor Brown’s Executive Order (EO) B-32-15, Caltrans is working with other state agencies to develop a California Sustainable Freight Action Plan, which contains a freight sustainability metric. This proposed metric, with freight-associated gross domestic product and carbon dioxide emission equivalent components, aims to reduce GHG emissions by relating the value of freight sector goods and services to the amount of carbon it produces.

Subpart G – National Performance Management Measures for Assessing the Congestion Mitigation and Air Quality Improvement Program – Traffic Congestion

The proposed measure to assess traffic congestion is Annual Hours of Excessive Delay per Capita.

- California Governor Jerry Brown signed Senate Bill (SB) 743 (Steinberg, 2013), which creates a process to change the way that transportation impacts are analyzed under the California Environmental Quality Act (CEQA). One legislative intent of SB 743 is to “more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.” Another legislative intent is to “Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns continue to be properly addressed and mitigated through CEQA.”
- Specifically, SB 743 requires the Governor’s Office of Planning and Research (OPR) to amend the CEQA Guidelines to provide an alternative to Level of Service (LOS) for evaluating transportation impacts. Vehicle Miles Traveled is the alternative criteria for determining a project’s significant impact. Once the CEQA Guidelines are amended to include the alternative criteria, auto delay will no longer be considered a significant impact under CEQA. The law will apply statewide after a two-year opt-in period. Transportation impacts related to air quality, noise and safety must still be analyzed under CEQA where appropriate.
- Caltrans Transportation Analysis Guide/Transportation Impact Study Guide (TAG/TISG) implements SB 743’s direction in transportation analysis for projects on the State Highway System (SHS) as well as our review of local development projects’ impact the SHS. The TAG/TISG will address performance measures, thresholds, induced demand, and other topics in addition to safety.

- The potential exists for FHWA’s performance measures to be contained with the state’s operational goals. Ultimately, Caltrans must meet federal performance measure requirements as well as state performance measure requirements that emerge from the TAG/TISG process.

Subpart H—National Performance Management Measures for Assessing the Congestion Mitigation and Air Quality Improvement Program—On-Road Mobile Source Emissions

The proposed measure to assess on-road mobile source emissions is Total Tons of Emissions Reduced from CMAQ Projects for Applicable Criteria Pollutants and Precursors.

- The Environmental Protection Agency (EPA) lowered the ozone standard in 2015, but have yet to designate the new nonattainment areas resulting from the change in the standard. There will likely be an increase in the number of isolated rural areas that will be nonattainment for ozone, which will affect the workloads of many State DOTs to differing degrees. If new isolated rural areas in California are added, there will be an incremental workload increase for Caltrans in order to carry out the calculations in Subpart H.

This is simply one example demonstrating that the NPRM works in tandem with the Clean Air Act’s implementing regulations, including the National Ambient Air Quality Standards (NAAQS), which continue to be made more stringent: as the NAAQS become more stringent over time, the workload for State DOTs and MPOs to comply with this NPRM will also increase over time. State DOTs and MPOs need to recognize the future increased workload for air quality compliance and performance measurement in order to prepare accordingly.

- With regard to section 490.809 data requirements, “For those projects that do not include a quantified emissions reduction...the CMAQ guidance allows for a qualitative assessment. This option is still allowed, but those projects will not be considered for the purposes of implementing the on-road mobile source emissions measure.” It is understandable for the NPRM to propose that projects with a qualitative assessment would not be part of a quantified summation of total emissions reductions, for ease of calculation. However, this would disregard the contribution of those projects in reducing emissions. Reasons for qualitative assessments could simply be a result of lack of data and/or insufficient capacity to perform a quantitative assessment. Leaving these projects out will under-count total emissions reductions.

Consideration of a Greenhouse Gas Emission Measure

Caltrans supports the inclusion of metrics to track GHG emissions, as FHWA has already acknowledged, reduction in VMT plays a key role in reducing greenhouse gas emissions. California has aggressive greenhouse gas reduction targets that apply to all State agencies, including Caltrans. In 2006, Assembly Bill (AB) 32 established a 20% reduction target from a 1990 baseline by 2020, and Governor Brown’s EO B-30-15 sets an 80% reduction target

for 2050. Accordingly, Caltrans and all California MPOs have created a set of tools and methods for measuring and reporting GHG emissions associated with the transportation system. This ten years of experience has given Caltrans a thorough understanding of the benefits and challenges of measuring and reducing GHGs from transportation. In reviewing the NPRM, Caltrans concentrated on proposing a measure and methods that capture the most significant emissions while creating consistency across all states. While California has invested heavily in developing the tools and methods to measure and model GHGs and policies that can reduce their emissions, Caltrans acknowledges that many states haven't yet addressed this issue and will need guidance and time to develop this expertise.

Measuring GHG emissions associated with state-owned transportation networks requires tools that accurately capture and model volumes, speed, load, and types of vehicles traveling on the highway system. These input data are often created through a combination of state/national travel surveys, travel demand models, and emissions models. On-road vehicle monitors (e.g. loop detectors, Bluetooth readers, global positioning systems) are used to calibrate and verify travel demand model outputs. Each of these tools require state-specific information and modeling, and uncertainty must be quantified and minimized at each step. Many states don't currently have detailed state travel surveys, travel demand models, nor robust on-road vehicle monitors. All of these tools require significant investment and technical expertise to establish and calibrate. Therefore, Caltrans recommends that FHWA prioritize the development of nationally consistent methods for creating state-specific household travel surveys, travel demand modeling, and on-road vehicle monitoring within this rulemaking. This will help standardize the states' emission measurement and allow FHWA to establish performance-based targets and policies during the next iteration of rulemaking. Following are responses to the FHWA inquiries regarding establishment of a carbon dioxide (CO₂) emissions measure in the final rule:

1. Should the measure address all on-road mobile sources or should it focus only on a particular vehicle type (e.g., light-duty vehicles)?
The measure should address all on-road mobile sources and vehicle types to maintain the ease of implementation. It is also important that fuel efficiency standards continue to be mandated by vehicle type.
2. Should the measure be normalized by changes in population, economic activity, or other factors (e.g., per capita or per unit of gross state product)?
No. Absolute total tons of CO₂ should be used because normalized numbers can hide a growth in total emissions. Normalized numbers could be derived from this absolute when there is a value in conducting analysis between states, but it should not be the metric by which emissions are tracked.
3. Should the measure be limited to emissions coming from the tailpipe, or should it consider emissions generated upstream in the life cycle of the vehicle operations (e.g., emissions from the extraction/refining of petroleum products and the emissions from power plants to provide power for electric vehicles)?
This NPRM should be limited to emissions coming from the tailpipe, because they capture the largest single source of greenhouse gas emissions. The measurement should concentrate on aspects of the transportation system that are under the jurisdiction of the

State DOTs such as roadway access or vehicle movement. It should not include emissions generated upstream in the life cycle of the vehicles (e.g., emission from the processing of fuel or electricity generation) since these factors are outside the jurisdiction of the State DOTs to implement improvements. Upstream emissions, while important, are primarily measured and controlled by Departments of Energy and public utilities.

4. Should the measure include non-road sources, such as construction and maintenance activities associated with Title 23 projects?

It shouldn't be included at this time. Tailpipe emissions capture the majority of emissions from the transportation system and should be a priority.

5. Should CO₂ emissions performance be estimated based on gasoline and diesel fuel sales, system use (vehicle miles traveled), or other surrogates?

CO₂ emissions performance should be based on mobile source emissions models. No single surrogate can accurately represent CO₂ emissions since the emissions are dependent on multiple variables including travel time, speed, and vehicle load. A technical advisory committee with experts from each state should be convened to create guidance for states to establish accurate transportation analysis tools (e.g., mobile source emissions models and travel demand models) that accurately capture CO₂ emissions based on vehicle operation. This committee should recommend a standard method and/or tool that all states can use, with the option to use comparable methods that exceed this standard by providing state-specific information.

6. Due to the nature of CO₂ emissions (e.g. geographic scope and cumulative effects) and their relationship to climate change effects across all parts of the country, should the measure apply to all States and MPOs? Is there any criteria that would limit the applicability to only a portion of the States or MPOs?

The measure should apply to all states and be reported by the State Departments of Transportation. Each state's DOT will be responsible for creating an accurate and consistent means of reporting GHG emissions, based on FHWA standards.

7. Would a performance measure on CO₂ emissions help to improve transparency and to realign incentives such that State DOTs and MPOs are better positioned to meet national climate change goals?

Yes.

8. The target establishment framework proposed in this rulemaking requires that States and MPOs would establish 2 and 4 year targets that lead to longer term performance expectations documented in longer range plans. Is this framework appropriate for a CO₂ emissions measure? If not, what would be a more appropriate framework?

No, the proposed framework is not appropriate. Targets should be long-range. There is too much potential for variability in short timeframes. Instead, states should focus on midrange (5-10 year) trends towards meeting a 20-25 year target. These targets should be part of the long-range statewide transportation plans.

9. Should short term targets be a reflection of improvements from a baseline (e.g., percent reduction in CO₂ emissions) or an absolute value?

Targets, both long and short, should be measured as improvements from a baseline. The measurement and targets should also align with existing planning cycles for State Transportation Plans (every five years). An absolute value would not be relatable for the public.

10. What data sources and tools are readily available or are needed to track and report CO₂ emissions from on-road sources?

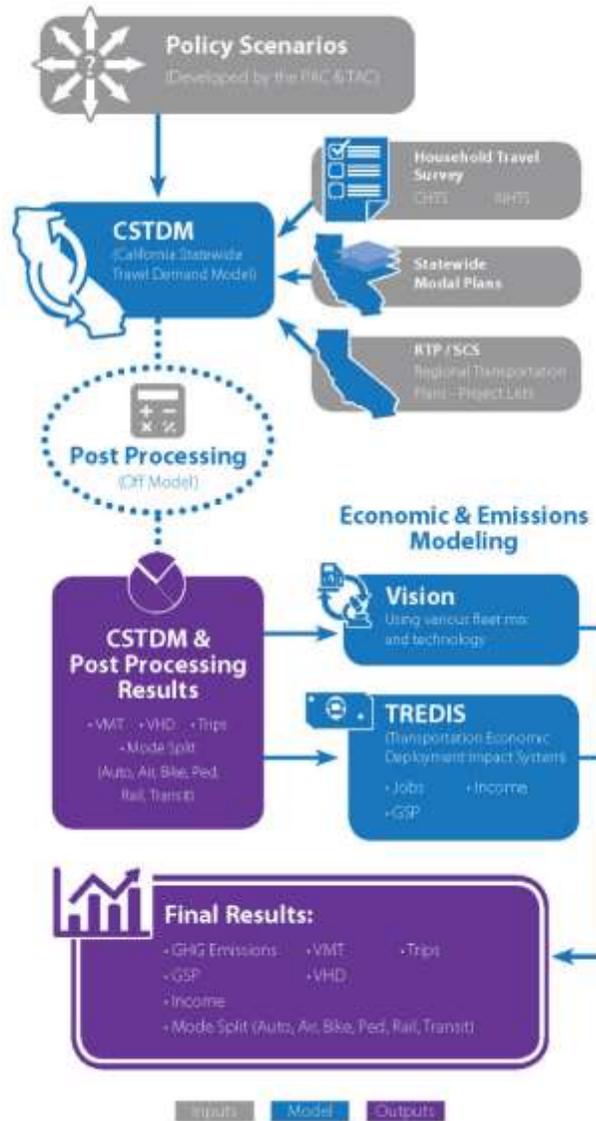
California has advanced data and tools for reporting CO₂ emissions due to SB 391, enacted in 2009, which requires the California Long-Range Transportation Plan (California Transportation Plan) to identify transportation system alternatives that would meet the State's CO₂ reduction targets from AB 32 and EO B-30-15.

The Vision for Clean Air Framework, released by the California Air Resources Board (ARB) in 2012, was developed to enhance ARB's ability to conduct transportation system-wide, multi-pollutant analysis to inform policy development. Initially based on the Argonne National Laboratory (ANL) national VISION model which only estimated on-road vehicle GHG emissions using national average emission factors, ARB's Vision 1.0 model included California specific data and methodologies and expanded the ability of the model to estimate upstream and tailpipe emissions of both GHG and criteria pollutants from the operation of light- and heavy- duty vehicles in California. The following graphic shows the data sources and process used for calculating California's CO₂ emissions.

Regarding data needs, vehicle load measurement may be an area of needed improvement. Some states will likely need more weigh stations and/or weigh-in-motion equipment to produce better data for their emissions estimates.

CTP2040 MODELING

CALIFORNIA TRANSPORTATION PLAN



11. What tools are needed to help transportation agencies project future emissions and establish targets for a CO₂ emission measure?

In addition to FHWA’s existing guidance and tools, states that are new to measuring tailpipe CO₂ emissions based on system use will need Federal guidance for developing robust household travel surveys and/or expanding the National Household Travel Survey (NHTS), state-of-the-practice travel demand models, and on-road vehicle monitoring. A probabilistic model may also help to quantify the margin of error within these tools and their application. Travel surveys and emissions models will need to be evaluated to ensure that electric vehicles and alternative fuel vehicles – including hydrogen, compressed natural gas, liquefied natural gas, and biofuels – are accounted for in the

measure. States also need a travel demand model that shows the synergistic relationship between transportation and land use in order to establish GHG reduction strategies and scenarios.

Caltrans has utilized a suite of tools to measure and reduce CO₂. Further refinement of these tools is needed, but they are an example for other states to follow. These tools include:

- a. the California Household Travel Survey
- b. additional survey questions within the National Household Travel Survey
- c. the California Statewide Travel Demand Model
- d. California Air Resources Board's Vision Model
- e. EMFAC – a California-specific emissions model
- f. Performance Measurement System (PeMS) – a network of 39,000 loop detectors

States need a model to show GHG benefits from tested scenarios. Currently we partner with the ARB to run our scenarios through their Vision Model.

12. How long would it take for transportation agencies to implement such a measure?

The time needed to implement such a measure depends on each state's existing expertise and experience with emissions modeling. The estimates below assume that a state has limited experience conducting an emissions measurement and would need to both develop and/or refine their existing data sets and emissions modeling tools.

Stage 1 – Travel Data Collection (3-4 years)

Create and implement minimum standards for

- Statewide travel surveys (3 years) – also could expand NHTS to provide more detailed, state-specific data
- Vehicle monitoring methods (2 years)

Stage 2 – On-Road GHG emissions Modeling and Calculation (2-3 years)

Federal guidance could help standardize states' creation and use of travel demand models like the California Statewide Travel Demand Model).

Ensure that emissions models (like the Motor Vehicle Emission Simulator model) incorporates electric and alternative-fuel vehicle types.

Stage 3 – Scenarios modeling (5 years or more)

Create land use-transportation models that can inform CO₂ reduction policies

13. Additionally, the FHWA requests data about the potential agency implementation costs and public benefits associated with establishing a CO₂ emissions measure.

It is difficult to state the costs associated with establishing a measure since they are dependent on the method selected for calculating emissions.

Public benefits – CO₂ reductions from the nation's transportation system are crucial to reducing the threat of climate change. The Intergovernmental Panel on Climate Change concluded in its Fifth Assessment Report, issued in 2014, that "warming of the climate

system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia" and that "continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems." As such, the public's well-being, health, natural resources, economy and environment are at risk of serious damage if CO₂ emissions are not swiftly reduced. Establishing a nationally-consistent CO₂ measure will allow FHWA to transparently track the transportation system's contribution to climate change, and create data-based targets and strategies to reduce these emissions.

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