



## SOUTHWEST ENERGY EFFICIENCY PROJECT

*Saving Money and Protecting the Environment Through More Efficient Energy Use*

August 15, 2016

### **SWEEP Comments re: National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality**

I would like to submit the following comments on behalf of the Southwest Energy Efficiency Project (SWEEP). We appreciate the opportunity to comment on the proposed measures, and appreciate the effort that has gone into developing the proposed measures. However, as described below, we argue that several of the measures of systems performance, freight movement and congestion proposed by FHWA are counterproductive, and will tend to lead to investments that are economically inefficient, harmful to the fabric of urban areas, and will lead to greater levels of greenhouse gas emissions; and that important measures of accessibility are missing. Our comments are applicable nationwide, but we use a number of examples from Colorado to illustrate the problems with a number of the proposed measures.

As described below, we support the Level Of Travel Time Reliability measure with modifications to adequately measure HOT lanes; we oppose the Peak Hour Travel Time Reliability measure; we support the Interstate System Mileage providing for Reliable Truck Travel Time measure if the numerator is modified to be the travel time at the 80<sup>th</sup> percentile; we oppose the Interstate Freight Mileage Uncongested measure; we believe the Annual Excessive Delay Per Capita measure is problematic, but that if adopted should be modified to allow local governments and regions to cooperatively set off-interstate facility target speeds, and to adequately measure delay experienced by HOV and transit riders. We also propose that FHWA consider additional measures of system and corridor performance that focus on accessibility, including per capita annual VHT, and per capita annual VMT.

#### **Standards for evaluating performance measures:**

There are several key attributes that appropriate measures should have.

First, the measure should incorporate average trip length. When metropolitan areas are making decisions about land use and transportation plans, there are important linkages and tradeoffs. In particular, metropolitan areas can choose urban forms and transportation networks that spread uses out, and provide very high levels of roadway capacity, or can choose more compact urban forms combined with better multimodal systems and more limited highway systems. The more compact approach tends to lead to shorter trip distances, and greater levels of accessibility by non automobile modes, but can also lead to lower vehicle travel speeds during congested periods. Measures that focus on vehicle speed, or comparisons of travel time between uncongested and congested periods will tend to rank more compact areas poorly even if they actually have lower travel times per capita.

In our region, this contrast is very evident. We see dramatically different patterns of travel in those areas that have compact development, and heavy investment in transit and active transportation, compared to those areas that are lower density, with longer trip lengths and much less transit-rich. For example, in downtown Denver only 43% of commute trips take place in a car<sup>1</sup> (as SOV or HOV), while in

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<sup>1</sup> Source: Downtown Denver Partnership 2014 commute survey



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the city as a whole 79% of trips take place in a car<sup>2</sup>. As part of an integrated land use and transportation strategy, the region has invested over four billion dollars in transit service that links to downtown and the city has zoned the downtown for intensive residential development, which will add tens of thousands of residents, most of whom are likely to work downtown. These changes will increase transit and walk/bike mode share and shorten trip lengths, and will likely reduce the total time spent traveling, but are likely to reduce average and peak period automobile travel speeds. An appropriate measure would capture the benefits of these changes.

In the real world, what matters to people is how long it takes them to travel, not what speed they are traveling. Traveling at 20 miles per hour for 5 miles is preferable to traveling at 60 miles per hour for 20 miles.

Second, the measure should reflect all modes of travel, not just cars. Communities that invest in vigorous multimodal systems may have many people who seldom or never have to experience congestion because their trips are happening in dedicated transit-ways, managed lanes, or on bicycle lanes that are separate from car traffic. The FHWA proposed measures simply ignores all of these trips and all of these people. It also ignores the distinction between HOV vehicles, buses, and SOVs. In the real world, the impacts of congestion are far worse in places where everyone has to drive than in places where many people have other options.

As an example, one of the major corridors in Colorado is US 36, which links Boulder and Denver. This highway includes 2 general purpose lanes in each direction, one HOT lane with BRT service, and a bikeway along the corridor. Each day, nearly 15,000 trips take place each day in the BRT vehicles, giving these transit riders congestion free travel even during rush hour<sup>3</sup>. An analysis completed in 2014 projected that nearly 50% of person trips on the HOT lanes will be transit riders or HOV passengers<sup>4</sup>. But none of the measures proposed by the FHWA count these trips- instead, a car with one person in it is treated the same as a BRT vehicle with 50 riders. Shouldn't the fact that 15,000 people per day have reliable, fast trips count in our measurements?

Third, the measure should recognize that the optimal level of peak period congestion is not zero. The economically efficient level of congestion is that level at which the marginal cost curve crosses the marginal demand curve. To quote from an FHWA primer on congestion pricing, it is the point at which "all the users of the highway value their trips at least as much as the incremental cost to society of adding more users<sup>5</sup>". Setting a standard in which any increase in travel reliability or reduction in hours of delay is considered an improvement is not rational – reducing congestion below the economically efficient level is a net negative, not an improvement. To its credit, the proposed Level of Travel Time Reliability measure does recognize that some level of peak period congestion is beneficial – only counting levels where the travel time at the 80% percentile is greater than 1.5 times the travel time at the 50<sup>th</sup> percentile. However, this is still essentially an arbitrary ratio. Shouldn't any such target be set based on an analysis of the tradeoffs, and the economically efficient level in a particular metro region?

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<sup>2</sup> Source: American Community Survey 2014 5-year average commute data for Denver

<sup>3</sup> <http://36commutingsolutions.org/rtds-flatiron-flyer-already-shows-a-ridership-increase-of-45-percent/>

<sup>4</sup>

[http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Managed\\_Lanes\\_in\\_CO\\_April\\_2014.pdf](http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Managed_Lanes_in_CO_April_2014.pdf)

<sup>5</sup> US FHWA, *Economics: Pricing, Demand, and Economic Efficiency—A Primer*,

[http://ops.fhwa.dot.gov/publications/fhwahop08041/cp\\_prim4\\_04.htm](http://ops.fhwa.dot.gov/publications/fhwahop08041/cp_prim4_04.htm)



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Fourth, measures should reflect the nature of the roadway systems that are being measured. Interstate highways should not have the same performance standards as urban arterials, since they serve very different purposes. Urban streets serve pedestrians, cyclists, and access to businesses and homes – all uses of the road that are harmed by high traffic speeds, and helped by slower traffic. Some of the proposed measures will harm efforts to retrofit existing arterials into complete streets – something which is already difficult, often pitting local officials against state DOTs that prioritize vehicle speed over all other values. These proposed measures will make this even worse. And even on interstates, the measure should recognize that urban interstates are very different than rural interstates. This is particularly problematic in the proposed measure for trucking, which considers an interstate congested when vehicle speeds are below 50 mph. This is simply inappropriate for urban highways.

Fifth, the measure should support, rather than undercut, other important measures and goals. As proposed, the performance measures for congestion do not support, and in practice may well be counterproductive, to goals for reduced levels of emissions of greenhouse gases and criteria pollutants. By contrast, the State of California has recently changed its state performance goals from a traditional LOS approach, which contains essentially the same flaws as the FHWA proposed approach, and replaced it with a new measure that focuses on VMT<sup>6</sup>. Investments and programs would be judged on the extent to which they reduce VMT – a measure that both tends to reduce total travel time and reduce emissions of GHGs and criteria pollutants.

In addition, whatever measures are chosen, there should be rigorous analysis required to evaluate what the actual, real world impacts are of transportation infrastructure or programmatic investments on whatever measure is ultimately chosen. The models used by state DOTs and MPOs do not in general adequately capture the impact of highway expansion on induced demand. Instead, they essentially assume that travel demand in a corridor is fixed, and that adding highway capacity will allow that fixed volume to be spread over a greater number of lanes, resulting in faster travel and less delay. Multiple academic studies have shown that this is simply false, and that in fact new traffic induced by roadway expansion removes essentially all travel time benefits<sup>7</sup>. Nonetheless, FHWA has repeatedly allowed projects to move forward based upon the premise that expanded highway capacity will reduce congestion. As part of the implementation of any performance standard, FHWA should require that induced demand be factored into traffic modeling, and should require rigorous measurements over time, from before construction, during construction, and for 5-10 years after project implementation. This type of analysis would likely push roadway strategies away from capacity expansion, and towards use of congestion pricing and system management – far more cost effective approaches with many fewer negative externalities.

With these criteria in mind, we offer the following suggestions on measures

### **System Performance**

#### **Preferred measure: Level of Travel Time Reliability (LOTTR)**

While we have some reservations about this measure, we believe that it is a reasonable measure and that travel time reliability is important to travelers. We support the use of the 50<sup>th</sup> percentile travel time as the basis for comparison, rather than free flow conditions. Most highways have their greatest throughput when operating at speeds below free flow conditions, and when a highway is operating

<sup>6</sup> [https://www.opr.ca.gov/docs/Revised\\_VMT\\_CEQA\\_Guidelines\\_Proposal\\_January\\_20\\_2016.pdf](https://www.opr.ca.gov/docs/Revised_VMT_CEQA_Guidelines_Proposal_January_20_2016.pdf)

<sup>7</sup> Duranton and Turner, 2009, *The Fundamental Law of Road Congestion: evidence from US Cities*, National Bureau of Economic Research, <http://www.nber.org/papers/w15376>



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efficiently during peak periods, the travel time will be greater than during free flow. We also support the use of the 80<sup>th</sup> percentile travel time as a reasonable numerator, which excludes unusual extreme events.

One suggestion we would make is to assure that the measure is able to adequately capture the impacts of HOT lanes. On many highways, there are very reliable travel times on HOT lanes, with much less reliable travel times in the general purpose (GP) lanes. Ideally, the measure should separately report the LOTTR and the number of person trips (not the number of vehicle trips) traveling during the 80<sup>th</sup> percentile hours for HOT lanes and GP lanes.

### **We do not support the use of the Peak Hour Travel Time Reliability (PHTTR) measure.**

This measure has multiple problems. It is not a uniform measure that allows meaningful national comparisons or comparisons across a region. It is also essentially a measure of delay, that is in conflict with the proposed measure of delay. It would also allow regions to set free flow speeds as the desired travel time objective even when this is economically irrational, and even when this exceeds the speed limits.

### **Freight measures**

Neither of the proposed measures adequately capture the efficiency of freight movement, since they are limited to truck travel and ignore the multimodal freight system. However, we recognize the limitations imposed in MAP-21 that restrict this to a measure of freight movement on interstate highways. Within this context, we offer the following comments.

### **Of the two measures, our preferred measure is a modified version of the Interstate System Mileage providing for Reliable Truck Travel Time**

This is a very similar measure to the LOTTR. However, inexplicably the proposal would use the 95<sup>th</sup> percentile of travel time for trucks as the numerator rather than the 80<sup>th</sup> percentile used for all other trips. There is no convincing justification given for using a different reliability measure that prioritizes the movement of trucks over the movement of passengers. In addition, many operational strategies will make a significant difference most of the time, but will not do much to shorten travel times during extreme events. By using the 95<sup>th</sup> percentile travel time, the benefits of these strategies will not be measured. We would propose that this measure be used, but with the 80<sup>th</sup> percentile as the numerator.

**We do not support the use of the Interstate Freight Mileage Uncongested measure.** This measure would set a target average truck travel speed of 50 mph, and define a stretch of interstate as uncongested when the average speed drops below 50 mph. In some areas, there are times when the speed limit is set lower than 50 mph; this is true both on urban highways, and in mountainous areas where the truck speed limit is often set below 50 mph on steep down grades. In addition, many loaded trucks are unable to travel at 50 mph on steep up grades in mountainous areas – Interstate 70 through Colorado has multiple passes where these issues occur. It is inappropriate to have a measure that defines trucks traveling at the speed limit or at the maximum physically possible speed as experiencing congestion because the speed is below 50 mph. Probably more important, it is an unrealistic goal in many urban areas. And it does not reflect the fact that lower truck speeds can be important for safety.

In addition, this measure is counterproductive for the goal of reducing GHG emissions. By rewarding average speeds of greater than 50 mph, states will be encouraged to set truck speed limits higher so



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that off peak speeds will be higher for averaging purposes. Since truck fuel consumption and GHG emissions during free flow conditions scale with the third power of speed, this will tend to increase fuel consumption and GHG emissions.

### **Measure of congestion:**

**We do not support the proposed Annual excessive delay per capita measure.** This measure would set a target of 35 mph on interstates and 15 mph on other facilities, and define travel at speeds below these as experiencing excessive delay. It sums up the vehicle hours of “excessive delay” during periods when speeds are below these thresholds, and normalizes by total population.

There are several reasons that we believe that this is a problematic measure. First, for the facilities other than interstates travel speeds below 15 mph may be quite appropriate in some places. In areas with high volumes of pedestrians and cyclists, during peak periods, keeping travel speeds below 15 mph dramatically reduces the incidence of serious injuries and fatalities to non-motorized travelers. Many strategies designed to increase pedestrian safety may reduce speeds below 15 mph. As an example, on a number of streets near the downtown and the University of Colorado the city of Boulder has used pedestrian activated lights that often slow traffic below 15 mph. This is part of a conscious effort to improve pedestrian safety. Many cities have instituted road diets with protected bike lanes that may reduce vehicle speeds below this threshold during peak periods. This measure defines these changes as creating excessive delay, and will make it less likely that cities or DOTs will institute such safety measures.

Second, the measure does not measure any trips other than single occupant vehicle trips. As a region targets improvements that may reduce delay, it would make sense to focus on those improvements that serve the greatest number of people. But this measure does not measure delay experienced by transit riders or HOV travelers. This means that the measure will not help states or regions target those strategies that would do the most to reduce person hours of delay. It also means that such strategies may be actively discouraged. For example, the city of Denver is proposing to convert one lane of State Highway 40 from a GP lane to a BRT lane during peak periods. This will increase delay as measured by this measure in the GP lane, but Alternatives Analysis done for the project shows that it will reduce total travel time, as there is very high transit ridership on this corridor<sup>8</sup>. An appropriate measure of delay would show this as an improvement, not a degradation of the measure.

**If this measure is to be used, we would propose improving it in at least two ways.** First, for facilities that are off the interstate system, allow the regions, in cooperation with local governments, to define the target speed for excessive delay as below 15 mph if deemed appropriate for a portion of that facility due to goals such as bicycle or pedestrian safety. Second, require that the delay calculations factor in average vehicle occupancy and transit riders when calculating total hours of delay.

**We would also recommend that FHWA develop measures of accessibility, which would better reflect the criteria we describe above.**

As a system level measure of performance, we would propose that FHWA consider

- 1) Daily VHT per capita – this would be a measure that reflects what people actually experience. It would measure how many hours of vehicle travel an average person requires. This measure

<sup>8</sup> City and County of Denver, [East Colfax Alternatives Analysis](#), 2015



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would reflect travel speeds – as it would get worse as travel speeds decline – but would also automatically reflect travel distances and travel by non auto modes.

- 2) Per capita VMT – this would be a measure that rewards actions that tend to reduce the distance that people need to drive, and reward actions that divert trips from driving to other modes.
- 3) A multimodal measure of accessibility that measures access to education, jobs, recreation and healthcare by walking, biking and public transit.

Sincerely yours,

Will Toor,  
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