Introduction/Overview

• TPM Background

• Metrics, Thresholds, and Measures

• Targets and Measures

• Timelines
What Is Transportation Performance Management (TPM)?

A strategic approach that uses system information to make investment and policy decisions to achieve transportation system performance goals.
23 CFR Part 490

• 17 Measures
• Describes the applicability of the measures
• Tells what data & reporting needed to support measures
• Includes target due dates
• Describes performance reporting requirements & timeline
• Defines the significant progress determination & minimum condition level determination process
# Measures: Safety (PM1)

<table>
<thead>
<tr>
<th>Measure Area</th>
<th>Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Number of fatalities</td>
</tr>
<tr>
<td></td>
<td><strong>Fatalities per million vehicle miles traveled</strong></td>
</tr>
<tr>
<td></td>
<td>Number of serious injuries</td>
</tr>
<tr>
<td></td>
<td><strong>Serious injuries per million vehicle miles traveled</strong></td>
</tr>
<tr>
<td></td>
<td>Number of non-motorized fatalities and non-motorized serious injuries</td>
</tr>
</tbody>
</table>

The Office of Safety website dedicated to this rule:

https://safety.fhwa.dot.gov/hsip/spm/
# Measures: Pavement & Bridge Condition (PM2)

<table>
<thead>
<tr>
<th>Measure Area</th>
<th>Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Performance Management Measures to</td>
<td>• % pavements of the Interstate System in Good condition</td>
</tr>
<tr>
<td>Assess Pavement Condition</td>
<td>• % pavements of the Interstate System in Poor condition</td>
</tr>
<tr>
<td></td>
<td>• % pavements of the non-Interstate NHS in Good condition</td>
</tr>
<tr>
<td></td>
<td>• % pavements of the non-Interstate NHS in Poor condition</td>
</tr>
<tr>
<td>National Performance Management Measures to</td>
<td>• % NHS bridges in Good condition</td>
</tr>
<tr>
<td>Assess Bridge Condition</td>
<td>• % NHS bridges in Poor condition</td>
</tr>
</tbody>
</table>

*U.S. Department of Transportation  
Federal Highway Administration  
Office of Highway Policy Information*
# Measures: System Performance & Freight (PM3)

<table>
<thead>
<tr>
<th>Measure Area</th>
<th>Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance of the National Highway System (System Performance)</td>
<td>• Interstate Travel Time Reliability Measure: % person-miles traveled on the Interstate that are reliable</td>
</tr>
<tr>
<td></td>
<td>• Non-Interstate Travel Time Reliability Measure: % person-miles traveled on the non-Interstate NHS that are reliable</td>
</tr>
<tr>
<td>Freight Movement on the Interstate System</td>
<td>• Freight Reliability Measure: Truck Travel Time Reliability (TTTR) Index</td>
</tr>
</tbody>
</table>
## Measures: CMAQ Program (PM3)

<table>
<thead>
<tr>
<th>Measure Area</th>
<th>Performance Measures</th>
</tr>
</thead>
</table>
| Measures to Assess the CMAQ Program: Traffic Congestion | • **Peak Hour Excessive Delay (PHED) Measure:** Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita  
  • Non-Single Occupancy Vehicle Travel (SOV) Measure: Percent of Non-Single Occupancy Vehicle (SOV) Travel |
| Measure to Assess the CMAQ Program: On-Road Mobile Source Emissions | • Emissions Measure: Total Emission Reductions |
PM3 Definitions

- *National Performance Management Research Data Set (NPMRDS):* derived from vehicle/passenger probe data (sourced from Global Positioning Station [GPS], navigation units, cell phones)
  - Covers the National Highway System (NHS)
  - Includes average travel times representative of all traffic and average travel times for freight trucks
  - Individual records represent 5-minute time periods for a travel time segment (can also be downloaded as 15-minute time periods), measured continuously throughout the year
Data Requirements – 23 CFR 490.103(f)

State DOTs, in coordination with MPOs, shall define a single set of reporting segments of the Interstate System and non-Interstate NHS for the purpose of calculating the travel time-based measures specified in §§ 490.507, 490.607, and 490.707 in accordance with the following:

• (1) Reporting segments shall be comprised of one or more contiguous Travel Time Segments of same travel direction. State DOTs have the option to accept the Travel Time Segments in the NPMRDS as the reporting segments;
• (2) Reporting segments shall not exceed 1 mile in length in urbanized areas unless an individual Travel Time Segment is longer and 10 miles in length in non-urbanized areas unless an individual Travel Time Segment is longer;
• (3) All reporting segments collectively shall be contiguous and cover the full extent of the directional mainline highways of the Interstate System and non-Interstate NHS required for reporting the measure;
• (4) The State DOT and applicable MPOs shall document, in manner that mutually agreed upon by all relevant parties, the coordination and agreement on the travel time data set and the defined reporting segments.
Equivalent Dataset – 23 CFR 490.103(e)

• (1) State DOTs and MPOs shall use the **same equivalent data source(s)** for a calendar year; and
• (2) The State DOT shall request **FHWA approval** for the use of such equivalent data source(s) no later than October 1st before the beginning of the calendar year in which the data source would be used to calculate metrics and FHWA must approve the use of that data source prior to a State DOT and MPO(s)’s implementation and use of that data source; and
• (3) The State DOT shall make the equivalent data source(s) available to FHWA, on request; and
• (4) The State DOT shall maintain and use a documented data quality plan to routinely check the quality and accuracy of data contained within the equivalent data source(s); and
• **Include the location (route, functional class, direction, State), length and begin and end points of each segment**
Definitions

- *Travel time reliability*: the consistency or dependability of travel times from day to day or across different times of the day
Required Data for Reliability Measures

- Travel time segment length
- Epoch (time interval, i.e., 15-minutes)
- Travel time: all vehicles
- Highway type (Interstate and non-Interstate NHS)
- AADT for each segment (HPMS)
- Average vehicle occupancy for all vehicles by specified area (provided by FHWA or locally derived)
Level of Travel Time Reliability (LOTTR) Metrics

- Calculated for each reporting segment
- Calculated for each of 4 time periods for the entire year (nearest hundredth)

\[
\text{LOTTR}_i = \frac{80\text{th Percentile Travel Time}_i}{50\text{th Percentile Travel Time}_i}
\]

Where \(i\) is the time period:

1. 6 a.m. – 10 a.m., weekdays
2. 10 a.m. – 4 p.m., weekdays
3. 4 p.m. – 8 p.m., weekdays
4. 6 a.m. – 8 p.m., weekends
Freight Reliability Required Data

- Travel time segment length (miles, to the nearest hundredth mile)
- Epoch (time interval, i.e., 15 minutes)
- Travel time: trucks (seconds)
  - Travel time all vehicles may be used where there are no data for trucks during a 15-minute epoch
- Highway type: Interstate
Truck Travel Time Reliability (TTTR) Metrics

• Computed for each time period for the entire year for Interstate segments only, rounded to nearest hundredth

\[ TTTR_i = \frac{95\text{th Percentile Travel Time}_i}{50\text{th Percentile Travel Time}_i} \]

Where \( i \) is the time period:

1. 6 a.m. – 10 a.m. weekdays
2. 10 a.m. – 4 p.m. weekdays
3. 4 p.m. – 8 p.m. weekdays
4. 8 p.m. – 6 a.m. all days
5. 6 a.m. – 8 p.m. weekends
§ 490.707 Peak Hour Excessive Delay (PHED) Measure

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>METRIC</strong></td>
<td>Total excessive delay (person-hours) for each reporting segment on the NHS</td>
</tr>
<tr>
<td><strong>THRESHOLD</strong></td>
<td>Travel Time at 20 mph OR at 60% of the posted speed limit (PSL) for each reporting segment, whichever is greater</td>
</tr>
<tr>
<td><strong>MEASURE</strong></td>
<td>States report on Urbanized area progress toward target</td>
</tr>
<tr>
<td><strong>TARGET</strong></td>
<td>Annual hours of PHED per capita for each urbanized area</td>
</tr>
</tbody>
</table>
Required Data for PHED Metric

- Travel time segment length
- Epoch (time interval, i.e., 15-minute units)
- Travel time: all vehicles
- Posted speed limit
- Urbanized area designation (urban code)
Definition of Peak Periods

• Calculations only need to be done for the following hours for **weekdays** (total 8 hours per day)
  • Morning Peak Hours are 6:00 a.m. – 10 a.m.
  • Afternoon Peak Hours are either (agency choice):
    • 3:00 p.m. – 7:00 p.m. or
    • 4:00 p.m. – 8:00 p.m.
More information:


www.fhwa.dot.gov/tpm/
Metrics, Thresholds & Measures

**Each Pavement Section or Reporting Segment**

**METRIC**
A quantifiable indicator of performance or condition

**THRESHOLD**
As used in the rule, the level for a segment that would determine condition rating or its inclusion in the measure

**MEASURE**
An expression based on a metric, used to establish targets and to assess progress toward achieving the established target

**Example**
IRI, RUTTING, FAULTING, CRACKING_PERCENT,

Good = IRI <95 & RUTTING <0.20 & CRACKING <5

1,000 lane−miles Good
2,000 total* lane−miles
= 50.0 % Good

*Bridge, missing/invalid/unresolved data, & unpaved/other surface type excluded for Pavement measures

Reference: 23 CFR 490.101
Targets & Measures

Established by: FHWA

MEASURE
An expression used to establish targets and to assess progress toward achieving the established target

Percentage of pavements of the Interstate System in Good condition

Established by: State DOTs & MPOs

TARGET
A quantifiable level of performance or condition, as a value for a measure, to be achieved within a time period required by FHWA

Target: 80.0%
Actual: 83.7%
✓ Target Achieved

Example

Reference: 23 CFR 490.101
Supporting Data Systems: HPMS

- Official Federal source of data on the extent, condition, performance, use and operating characteristics of the nation’s highways
- Populated by States using each State’s linear referencing system
- Data requirements: *HPMS Field Manual (December 2016 version)*
Data Needed for Calculating the National Pavement Measures

**Inventory Data:**
- Section Length (End_Point-Begin_Point)
- NHS
- Facility Type
- Through Lanes*
- Functional System
- Surface Type
- Structure Type
- Urban Code

* Directional Through Lanes for dual-carriage reporting for Interstates (optional)

**References:**
23 CFR 490.311, 309, 103, and 101
Data Needed for Calculating the National Pavement Measures

Condition Data:

• Roughness (IRI) (MRI)
• Rutting (asphalt pavements only)
• Cracking Percent
• Faulting (concrete pavements only)
• Can use Present Serviceability Rating (PSR) only where speed limit < 40 mph

References: 23 CFR 490.309, 111 and 311
Pavement Sections*

• **Spatial Coincidence of Metric Data**
  - 23 CFR 490.309: States DOTs must report condition metrics (CRACKING_PERCENT, FAULTING, IRI and RUTTING) for each pavement section. HPMS Field Manual: CRACKING_PERCENT (Data Item 52), FAULTING (Data Item 51), and RUTTING (Data Item 50) is to be reported for mile-point limits that are consistent with those reported for IRI (Data Item 47).
    - Asphalt: CRACKING_PERCENT, IRI and RUTTING
    - Jointed Concrete: CRACKING_PERCENT, FAULTING, and IRI
    - CRCP: CRACKING_PERCENT and IRI
  
  Reference: 23 CFR 490.311

• **Section Length**
  - 23 CFR 490.309(b) and 23 CFR 490.311(c): State DOTs to collect condition metrics (CRACKING_PERCENT, FAULTING, IRI, PSR, and RUTTING) continuously in a manner that will allow for reporting in nominally uniform pavement section lengths of 0.10 mile with 0.11-mile maximum length of “pavement sections.” Shorter pavement sections are permitted only at the beginning of a route, the end of a route, at bridges, or other locations where a section length of 0.1 mile is not achievable.

Reference: HPMS Field Manual: data items 48, 50, 51, and 52
Pavement Sections

- **Violate Spatial Coincidence (example)**
  
  2018|##|Route AAA|0.000|0.100|IRI|0.050|60|01/2018|
  2018|##|Route AAA|0.100|0.200|IRI|0.100|65|01/2016|
  2018|##|Route AAA|0.000|0.200|RUTTING|0.150|0.20|01/2018|

- **Violate Section Length (example)**
  
  2018|##|Route AAA|0.000|0.200|RUTTING|0.200|0.1|01/2018|
PM2 Performance Data Timeline

**Consequence of not submitting data by Due Date**
- Interstate System will be considered as not meeting the minimum requirements (23 CFR 490.313(b)(4)(ii))

**Measure Computation**
- Calculation of overall pavement conditions ... will be based only on sections containing data reported in the HPMS Submittal as of the submission dates (April 15 & June 15) 23 CFR 490.313(b)(4)(ii)
- Computed, if the Missing, invalid, or unresolved data ≤ 5.0% requirement is met (23 CFR 490.313(f))

**Missing, invalid, or unresolved data > 5.0%?**
- a State DOT has not made significant progress toward the achievement of target (23 CFR 490.109(e)(4)(ii)&(iii))

Reference: 23 CFR 490.315
Conclusion

Robert Rozycki
FHWA (HPPI-20)
1200 New Jersey Ave. SE
Washington DC 20590
Phone: 202-366-5059
Email: robert.rozycki@dot.gov