Memphis MPO Performance Measures

Engineering and Technical Committee (ETC)
Online Workshop

Tuesday, October 2, 2018

Agenda

- **Welcome and Introductions**
- **PM1 (Safety) Overview**
- **PM2 (Infrastructure) Overview**
  - TDOT + MDOT
  - MPO
- **PM3 (System Performance) Overview**
  - TDOT + MDOT
  - MPO
- **Q&A/Discussion**

PM: Target Setting - Overview

PM1:

Safety

(ROUND 2 UNDERWAY)

PM2:

Infrastructure Condition

(UNDERWAY)

PM3:

System Performance

(UNDERWAY)

PM1: Safety

PM1: Safety

- **Area** – Individual State Targets for all public roads in the state **developed and adopted annually**
- **Data** – Highway Performance Monitoring System (HPMS) and Fatality Analysis Reporting System (FARS)
- **Performance Measures –**
  - Number of Serious Injuries
  - Rate of Serious Injuries per 100 Million VMTs
  - Number of Fatalities
  - Rate of Fatalities per 100 Million VMTs
  - Number of Non-motorized Fatalities and Serious Injuries
- **Calculation** –
  - 5-Year Rolling Average of 5 individual, consecutive points of data.
    - *Number Targets – Arithmetic average, rounded to tenths place*
    - *Rate Targets – Average, rounded to the thousandths place*

PM1: Tennessee

Safety Performance Measure	Round 1		Round 2	
	Baseline (2012-2016)	Target (2014-2018)	Baseline (2013-2017)	Target (2015-2019)
Number of Fatalities	995.6	1021.4	1000.6	1022.0
Fatality Rate	1.358	1.337	1.329	1.291
Number of Serious Injuries	7319.4	7630.8	7227.6	7374.6
Rate of Serious Injuries	9.976	9.982	9.594	9.324
Number of Non-Motorized Fatalities and Serious Injuries	434.6	493.2	467.7	546.8

PM1: Mississippi

Safety Performance Measure	Round 1		Round 2	
	Baseline (2012-2016)	Target (2014-2018)	Baseline (2013-2017)	Target (2015-2019)
Number of Fatalities	633.8	677.8	655.4	697.3
Fatality Rate	1.606	1.668	1.640	1.706
Number of Serious Injuries	567.6	574.4	550.2	555.5
Rate of Serious Injuries	1.439	1.425	1.378	1.356
Number of Non-Motorized Fatalities and Serious Injuries	111.8	119.8	116.0	131.4

PM1: TN-MS Comparison (Round 2)

Safety Performance Measure	Tennessee Baseline	Tennessee Target	Mississippi Baseline	Mississippi Target
Number of Fatalities	1000.6	1022.0	655.4	697.3
Fatality Rate	1.329	1.291	1.640	1.706
Number of Serious Injuries	7227.6	7374.6	550.2	555.5
Rate of Serious Injuries	9.594	9.324	1.378	1.356
Number of Non-Motorized Fatalities and Serious Injuries	467.7	546.8	116.0	131.4

PM2: Pavement & Bridge Condition

PM2: Performance Measures

Subpart C:
Pavement Condition
State DOT Due Date: May 20, 2018
MPO Due Date: Nov. 16, 2018

- Percentage of Pavement in Good Condition (*Interstate*)
- Percentage of Pavement in Poor Condition (*Interstate*)
- Percentage of Pavement in Good Condition (*Non-Interstate NHS*)
- Percentage of Pavement in Poor Condition (*Non-Interstate NHS*)

Subpart D:
Bridge Conditions
State DOT Due Date: May 20, 2018
MPO Due Date: Nov. 16, 2018

- Percentage of Bridges in Good Condition (*NHS*)
- Percentage of Bridges in Poor Condition (*NHS*)

PM2: Pavement Condition

- **Area** – Individual State 2 & 4 Year Targets for the Non-Interstate NHS and 4 Year Target for Interstate (MPO: 4 Year Target Only)
- **Data** – Highway Performance Monitoring System (HPMS)
- **Performance Measures** –
  - % of Interstate Pavements in Good and Poor Condition
  - % of non-Interstate NHS Pavements in Good and Poor Condition
- **Calculation** –
  - Good and Poor Condition Rating Areas: International Roughness Index (IRI), Cracking, Rutting (Asphalt pavements), and Faulting (Concrete pavements)

PM2: Pavement Condition - TN

Performance Measure	Shelby + Fayette (Baseline)	Tennessee (Baseline)	Tennessee (4-Year Target)
Percent of Pavement in Good Condition (Interstate)	73.1%	75.6%	60.0%
Percent of Pavement in Poor Condition (Interstate)	~0.1%	0.14%	1.0%
Percent of Pavement in Good Condition (Non-Interstate NHS)	13.8%	72.7%	40.0%
Percent of Pavement in Poor Condition (Non-Interstate NHS)	17.5%	6.7%	4.0%

PM2: Pavement Condition - MS

Performance Measure	DeSoto + Marshall (Baseline)	Mississippi (Baseline)	Mississippi (4-Year Target)
Percent of Pavement in Good Condition (Interstate)	52.2%	75.0%	55.0%
Percent of Pavement in Poor Condition (Interstate)	0%	0.99%	5.0%
Percent of Pavement in Good Condition (Non-Interstate NHS)	17.5%	62.5%	25.0%
Percent of Pavement in Poor Condition (Non-Interstate NHS)	4.1%	9.3%	5.0%

PM2: Bridge Condition

- **Area** – Individual State 2 & 4 Year Targets for all bridges carrying the NHS, including on- and off- ramps (MPO: 4 Year Target Only)
- **Data** – National Bridge Inspection Standards (NBIS)
- **Performance Measures** –
  - % of NHS Bridges by deck area classified as in Good or Poor Condition
- **Calculation** –
  - Good and Poor Condition Rating Areas: Deck, Superstructure, Substructure, and Culvert

PM2: Bridge Condition - TN

Performance Measure	Shelby + Fayette (Baseline)	Tennessee (Baseline)	Tennessee (4-Year Target)
Percent of Bridges in Good Condition	29.6%	39.5%	36.0%
Percent of Bridges in Poor Condition	3.9%	3.5%	6.0%

PM2: Bridge Condition - MS

Performance Measure	DeSoto + Marshall (Baseline)	Mississippi (Baseline)	Mississippi (4-Year Target)
Percent of Bridges in Good Condition	48.2%	61.7%	60.0%
Percent of Bridges in Poor Condition	0.6%	2.1%	5.0%

PM3: System Performance

Performance Measures

Subpart G:
Traffic Congestion
State DOT & MPO Due Date: May 20, 2018

- Annual Hours of Peak-Hour Excessive Delay
- Percentage of Non-Single Occupancy Vehicle Travel

Subpart H:
Total Emissions Reduction
State DOT Due Date: May 20, 2018
MPO Due Date: November 16, 2018

- Total Emissions Reductions (VOC) kg/day
- Total Emissions Reductions (CO) kg/day
- Total Emissions Reductions (NOx) kg/day

Subpart E:
Travel Time Reliability
State DOT Due Date: May 20, 2018
MPO Due Date: November 16, 2018

- Percentage of Person Miles Traveled that are Reliable (Interstate)
- Percentage of Person Miles Traveled that are Reliable (Non-Interstate NHS)

Subpart F:
Freight Reliability
State DOT Due Date: May 20, 2018
MPO Due Date: November 16, 2018

- Truck Travel Time Reliability Index

PM3: On-Road Mobile Source Emissions

- **Area** – Individual State 2 & 4-Year Targets (Applies to Memphis & Knoxville)
- **Data** – FHWA CMAQ Public Access System (UPACS)
- **Performance Measure** –
  - Total Emissions Reduction
- **Calculation** –
  - Cumulative 2 and 4-Year Emissions Reduction for CMAQ funded projects of reduced emissions for:
    - Nitrogen Oxides (NOx)
    - Volatile Organic Compounds (VOCs)
    - Carbon Monoxide (CO)
      - *Not applicable to Mississippi state target*

PM3: Emissions Targets – TN

Total Emissions Reduction Performance Measures	Baseline (FY 14-17)	2-Year Target (FY 18-19)	4-Year Target (FY 18-21)
Total Emissions Reductions (VOC) kg/day	230.025	30.698	61.396
Total Emissions Reductions (CO) kg/day	530.282	75.000	150.000
Total Emissions Reductions (NOx) kg/day	363.399	62.840	125.680

PM3: Emissions Targets- MS

Total Emissions Reduction Performance Measures	Baseline (FY 14-17)	2-Year Target (FY 18-19)	4-Year Target (FY 18-21)
Total Emissions Reductions (VOC) kg/day	28.000	> 0	> 0
Total Emissions Reductions (CO) kg/day	N/A	N/A	N/A
Total Emissions Reductions (NOx) kg/day	85.000	> 0	> 0

PM3: Travel Time Reliability

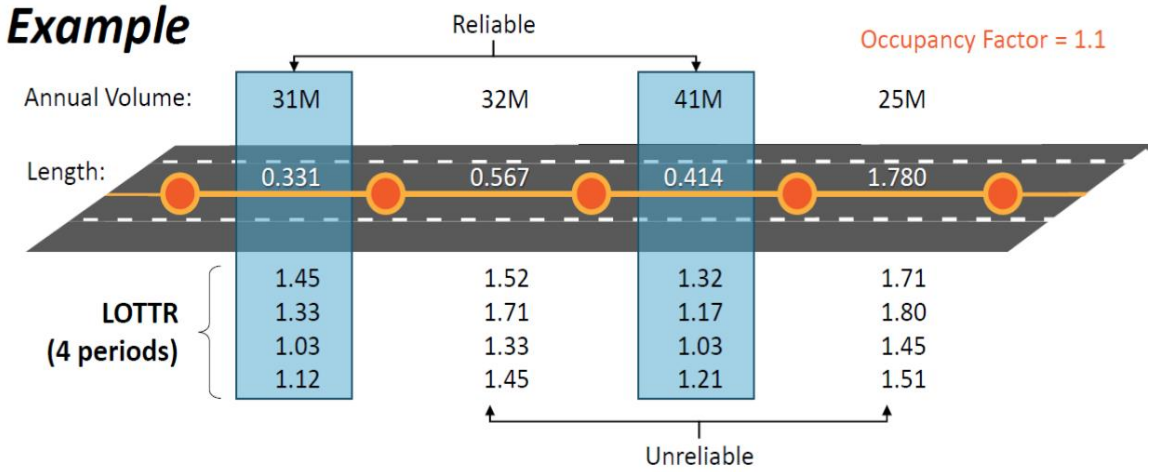
- **Area** – Individual State 2 & 4 Year Targets for Interstate and 4 Year Target for Non-Interstate (MPO: 4 Year Target Only)
- **Data** – National Performance Management Research Data Set (NPMRDS) & Highway Performance Monitoring System (HPMS)
- **Performance Measures** –
  - Percent of the Person Miles Traveled on the **Interstate** that are reliable
  - Percent of the Person Miles Traveled on the **Non-Interstate NHS** that are reliable
- **Calculation** –
  - $Level\ of\ Travel\ Time\ Reliability = \frac{\text{80th Percentile Travel Time}}{\text{50th Percentile Travel Time}}$
    - *Level of Travel Time Reliability (LOTTR) for the reporting segment must be less than 1.50 to be considered reliable*

PM3: Travel Time Reliability

- **Calculation** –
  - $\textit{Level of Travel Time Reliability}\ (\text{Step 1}) = \dfrac{\text{80th Percentile Travel Time}}{\text{50th Percentile Travel Time}}$
    - *Level of Travel Time Reliability (LOTTR) for the reporting segment must be less than 1.50 to be considered reliable*
  - $\textit{Level of Travel Time Reliability}\ (\text{Step 2}) = \dfrac{\sum_{i=1}^{R} SL_i\ X\ AV_i\ X\ OF_j}{\sum_{i=1}^{T} SL_i\ X\ AV_i\ X\ OF_j}$
    - R= Total number of Interstate (or Non-Interstate NHS) System reporting segments that are exhibiting an LOTTR below 1.50 during all of the time periods
    - SL_i = Length, to the nearest thousandth of a mile, of Interstate System reporting segment "i";
    - AV_i = Total annual traffic volume to the nearest single vehicle, of the Interstate System reporting segment "i";
    - J = Geographic area in which the reporting segment "i" is located where a unique occupancy factor has been determined;
    - OF_i = Occupancy factor for vehicles on the NHS within a specified geographic area within the State/Metropolitan planning area; and
    - T = Total number of Interstate System reporting segments.

PM3: Travel Time Reliability

Example Calculation



$$\text{Travel Time Reliability Measure} = \frac{(0.331 \times 31 \times 1.1) + (0.414 \times 41 \times 1.1)}{(0.331 \times 31 \times 1.1) + (0.567 \times 32 \times 1.1) + (0.414 \times 41 \times 1.1) + (1.780 \times 25 \times 1.1)}$$

$$= \frac{11.287 + 18.671}{11.287 + 19{,}958 + 18.671 + 48.950}$$

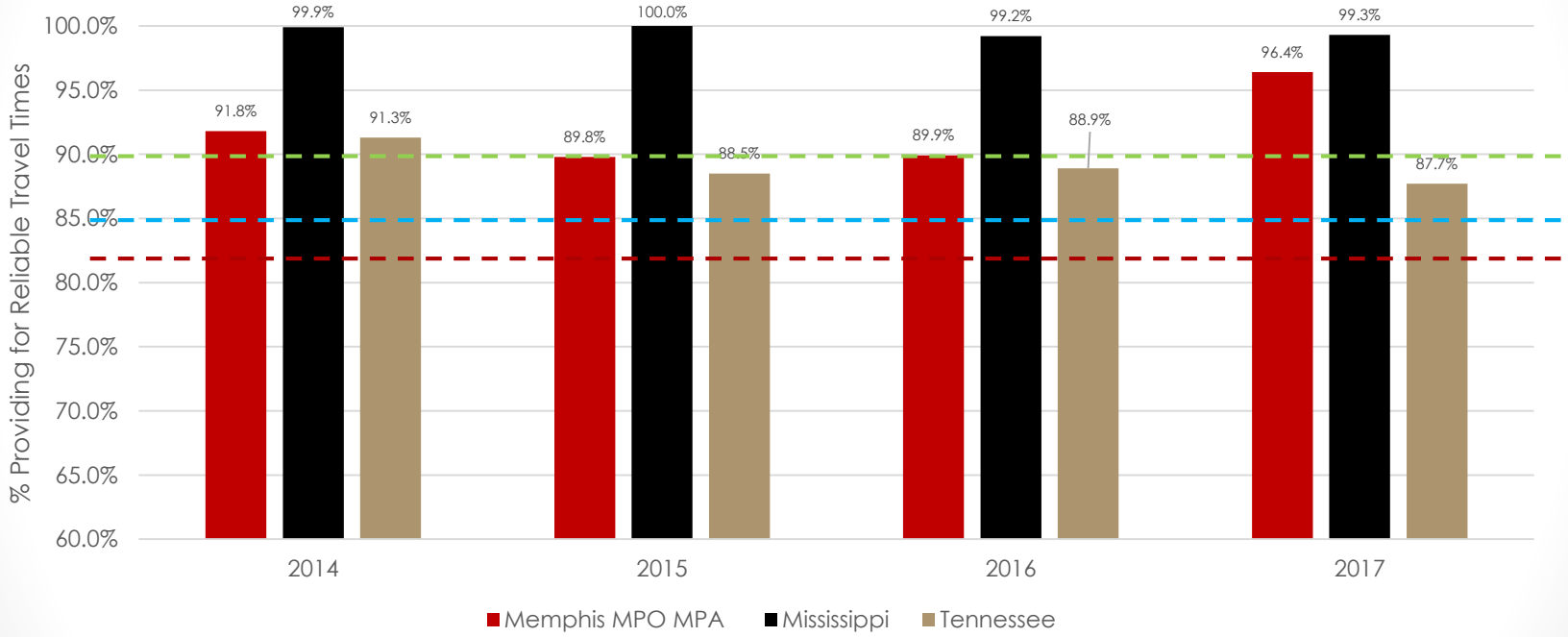
$$= \frac{29.958}{98.866}$$

$$= 30.3\%$$

U.S. Department of Transportation
Federal Highway Administration

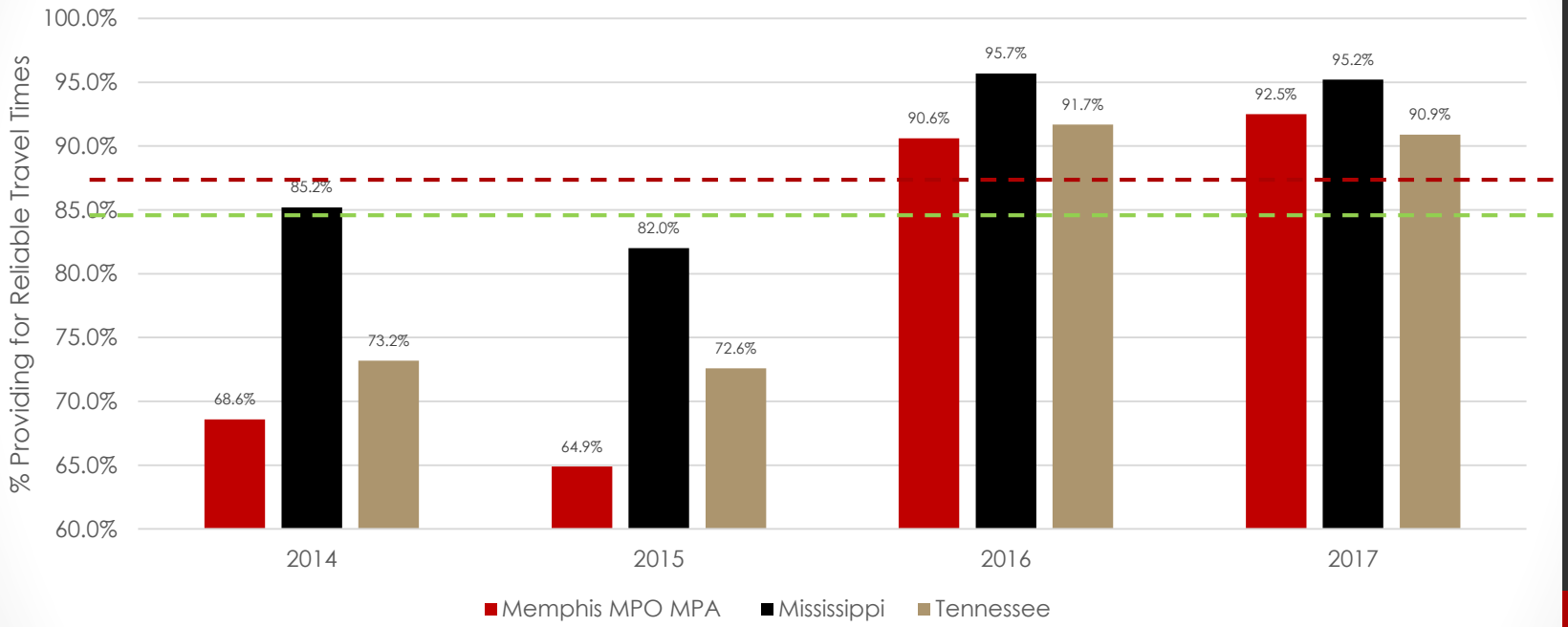
% of Interstate Providing for Reliable Travel Times (2014-2017) Baseline Data

**Data Source: NPMRDS HERE (2014-2015) and NPMRDS INRIX (2016-2017)*



% of Non-Interstate NHS Providing for Reliable Travel Times (2014-2017) Baseline Data

**Data Source: NPMRDS HERE (2014-2015) and NPMRDS INRIX (2016-2017)*



TDOT 4 Year Target: 87.5%

MDOT 4 Year Target: 85%

PM3: Travel Time Reliability Targets

Travel Time Reliability Performance Measures	Tennessee (TDOT)		Mississippi (MDOT)	
	Baseline (2017)	4-Year Target (2021)	Baseline (2017)	4-Year Target (2021)
Percentage of Person Miles Traveled that are Reliable (Interstate)	87.7%	83.0%	99.3%	90.0%
Percentage of Person Miles Traveled that are Reliable (Non-Interstate NHS)	N/A	87.5%	N/A	85.0%

PM3: Freight Movement

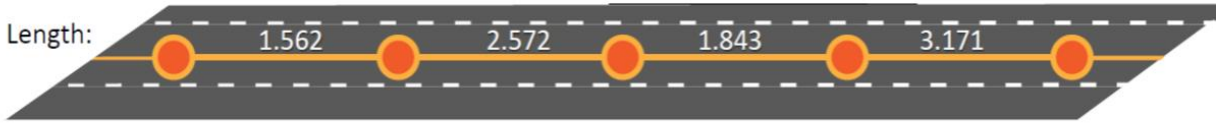
- **Area** – Individual State 2- and 4-Year Targets (MPO: 4 Year Target Only)
- **Data** – National Performance Management Research Data Set (NPMRDS)
- **Performance Measure** –
  - Percent of the Interstate System Mileage providing for Reliable Truck Travel Times (Truck Travel Time Reliability Index)
- **Calculation** –
  - $$Truck\ Travel\ Time\ Reliability = \frac{\text{95th Percentile Truck Travel Time}}{\text{50th Percentile Truck Travel Time}}$$

PM3: Freight Movement

- **Calculation** –
  - $Truck\ Travel\ Time\ Reliability(\text{Step 1}) = \frac{\text{95th Percentile Truck Travel Time}}{\text{50th Percentile Truck Travel Time}}$
  - $Truck\ Travel\ Time\ Reliability(\text{Step 2}) = \frac{\sum_{i=1}^{T}(SL_i\ X\ maxTTTR_i)}{\sum_{i=1}^{T}(SL_i)}$
  - i = An Interstate System reporting segment;
  - $maxTTTR_i$ = The maximum TTTR of the five time periods in paragraphs SL i = Segment length, to the nearest thousandth of a mile, of Interstate System reporting segment "i"; and
  - T = A total number of Interstate System reporting segments.

PM3: Freight Movement

Example Calculation



TTTR	1.50	2.10	1.45	1.56
	1.38	1.83	1.71	2.30
	1.70	1.79	1.62	2.12
	1.30	1.42	1.22	1.82
	1.21	1.03	1.01	1.27

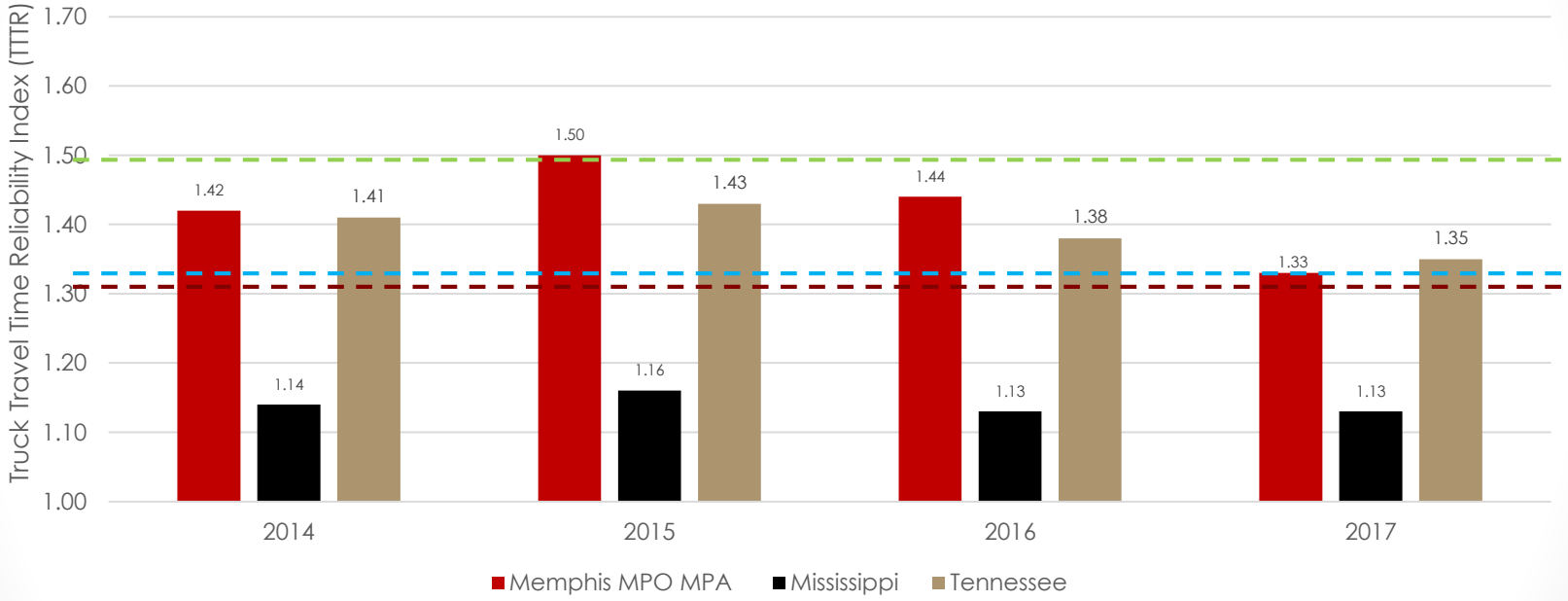
$$\text{TTTR} = \frac{(1.70 \times 1.562) + (2.10 \times 2.572) + (1.71 \times 1.843) + (2.30 \times 3.171)}{(1.562 + 2.572 + 1.843 + 3.171)}$$

$$= \frac{2.655 + 5.401 + 3.152 + 7.293}{9.148}$$

$$= 2.022$$

Truck Travel Time Reliability Index (TTTR) Baseline Data

**Data Source: NPMRDS HERE (2014-2015) and NPMRDS INRIX (2016-2017)*



TDOT 2 Year Target: 1.35

TDOT 4 Year Target: 1.33

MDOT 2 & 4 Year Target: 1.5

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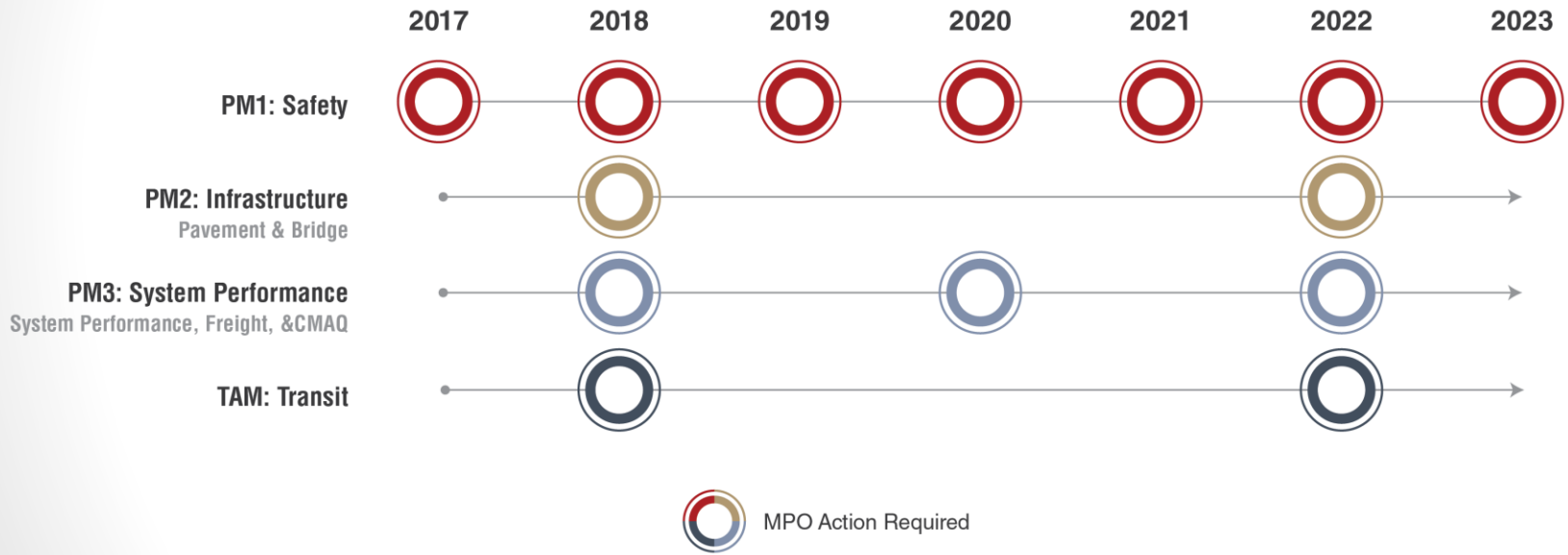
PM3: Freight Reliability Targets

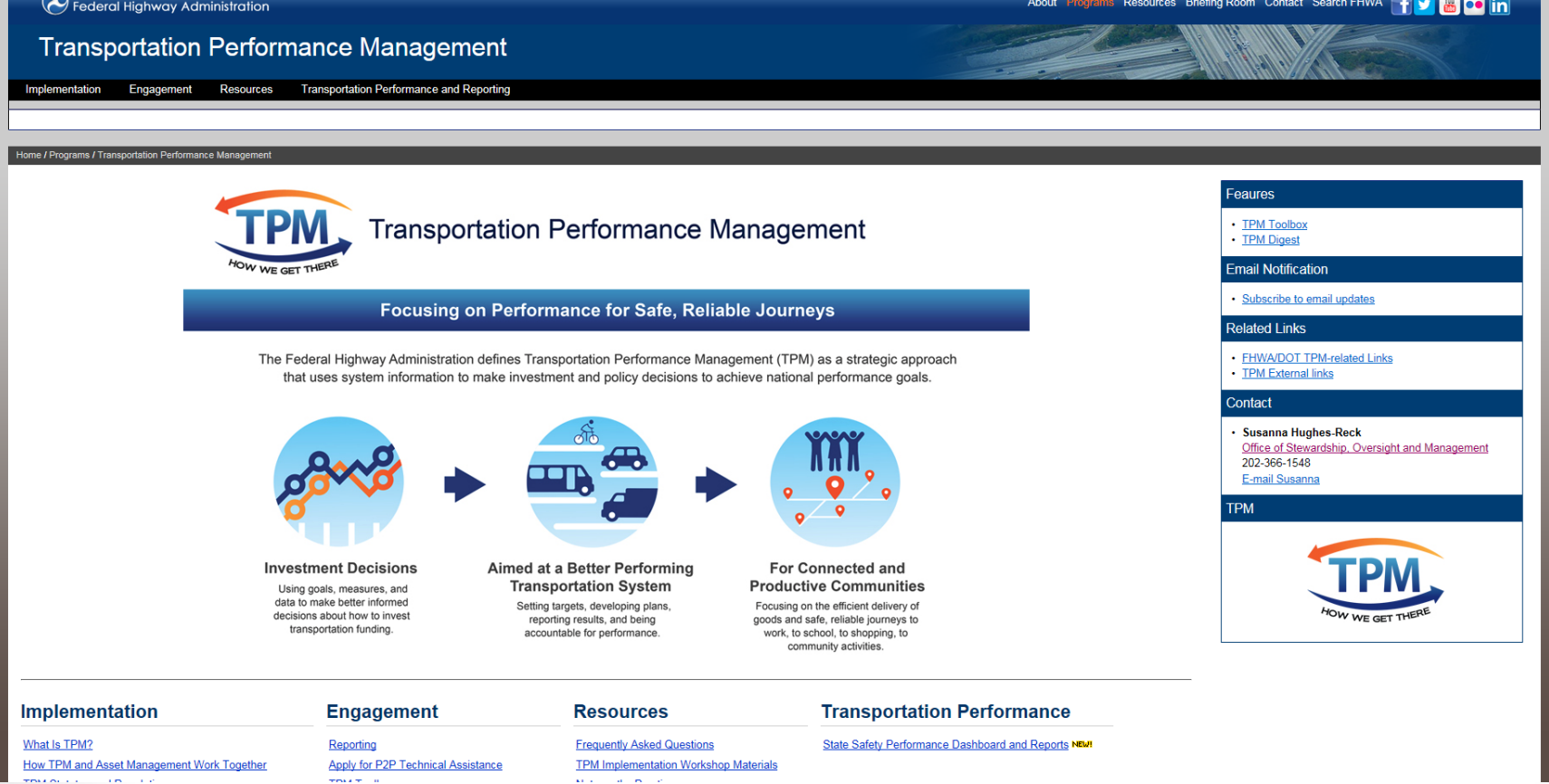
Freight Reliability Performance Measures	Tennessee (TDOT)		Mississippi (MDOT)	
	Baseline (2017)	4-Year Target (2021)	Baseline (2017)	4-Year Target (2021)
Truck Travel Time Reliability (TTTR) Index	1.35	1.33	1.13	1.50

PM: Target Setting - Timeline



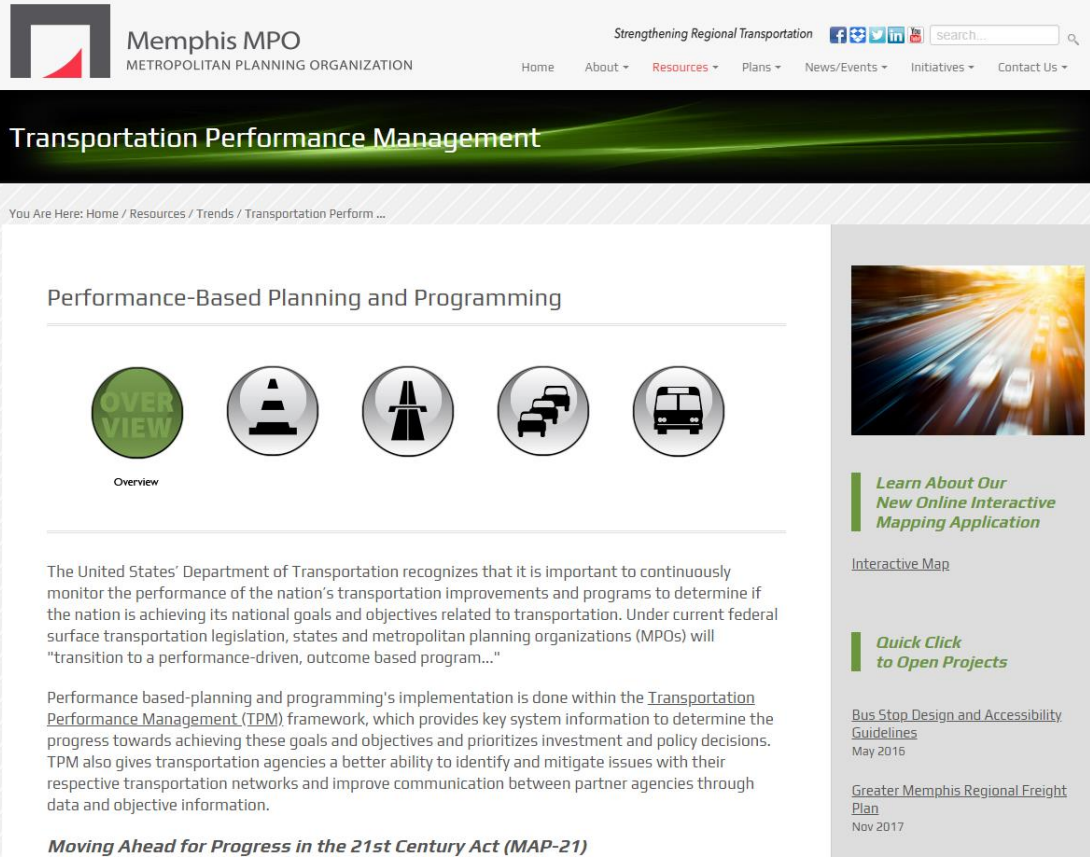
Next Steps

- MPO Deadline November 16, 2018 (**PM2**&**PM3**)
- MPO Deadline February 27, 2019 (**PM1**)
- ETC/TPB Meetings ACTION
  - **Recommended Action – Support State (TDOT/MDOT) Targets**
    - ETC Meeting November 1, 2018
    - TPB Meeting November 15, 2018
- Regular Review of Targets



FHWA's Transportation Performance Management Website

www.fhwa.dot.gov/tpm/



Memphis MPO's Performance Measures Webpages

http://memphismpo.org/resources/trends/performance-measures

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