Iowa DOT System Performance and Freight Performance Measures: Status Update

September 2024

Required Performance Measures

Through the Moving Ahead for Progress in the 21st Century (MAP-21) Act, Congress required the establishment of measures to assess performance in several areas, including performance of the Interstate and non-Interstate National Highway System (NHS), codified in 23 CFR 490.507, and freight movement on the Interstate System, codified in 23 CFR 490.607. Departments of Transportation (DOTs), as well as Metropolitan Planning Organizations (MPOs) with applicable roadways within their metropolitan planning areas, set targets for the following performance measures, known as "PM3."

1. Percent of person-miles traveled on the Interstate that are reliable
2. Percent of person-miles traveled on the non-Interstate NHS that are reliable
3. Truck Travel Time Reliability Index (Interstate only)

Targets are set for all roadways on the applicable system within a state or MPO, regardless of ownership. Target setting occurs for 4-year periods, with the first targets having been established in 2018 for the performance period of calendar year (CY) 2018-2021. On October 1, 2022, states set 2- and 4-year targets for the second reporting period of CY 2022-2025. MPOs then had 180 days to take action to either support the state's 4-year targets or set their own.

Mid-Performance Period Progress Report

State DOTs are required to submit a Mid-Performance Period Progress Report (MPPPR) to the Federal Highway Administration (FHWA) by October 1, 2024. The MPPPR includes information on the effectiveness of investment strategies and progress towards 2-year targets. The MPPPR also provides an opportunity for states to adjust their 4-year targets. If a state adjusts any 4-year targets, any MPOs that supported the state's 4-year targets then have 180 days to reaffirm support for the adjusted target or set their own 4-year target.

Iowa DOT is not proposing any adjustments to the 4-year targets for the PM3 measures. The remainder of this memo will outline the PM3 measures and targets and their current status.

Data and Methodology

Data for these measures is provided by the Federal Highway Administration (FHWA) through the National Performance Management Research Data Set (NPMRDS). This is a national data set of average travel times on the NHS. Since February 2017, speed and travel time data from INRIX has been used for the NPMRDS, which is hosted by the University of Maryland Center for Advanced Transportation Technology Laboratory (CATT Lab). States and MPOs can access the raw data at no cost. The CATT Lab has also developed a MAP-21 tool to assist states and MPOs in calculating PM3 measures. This tool is available through a technical services program (TSP) administered by the American Association of State Highway and Transportation Officials (AASHTO). Iowa DOT is currently participating in the TSP; this participation also provides Iowa's MPOs access to the MAP-21 tool and output.

State DOTs must establish 2- and 4-year targets for the percent of reliable person-miles on the Interstate System and the non-Interstate NHS. The level of travel time reliability (LOTTR) is the metric for determining the performance measures. The LOTTR is calculated for four time periods:

1. Weekdays from 6:00 a.m. – 10:00 a.m.
2. Weekdays from 10:00 a.m. – 4:00 p.m.
3. Weekdays from 4:00 p.m. – 8:00 p.m.
4. Weekends from 6:00 a.m. – 8:00 p.m.

Data for all vehicle traffic are analyzed based on 15-minute bins of speeds and travel times for traffic message channels (TMCs), which are highway segments that NPMRDS data are reported for. For each time period across an entire year, the TMC's LOTTR is defined as the ratio of the longer travel time (80th percentile) to a "normal" travel time (50th percentile) for all vehicles. FHWA defines a segment as reliable if its LOTTR is less than 1.50 during all four time periods. If the maximum LOTTR from the four time periods is 1.50 or higher, the segment is unreliable. To translate the LOTTR to the performance measure, the length of each segment is multiplied by its annual average daily traffic (AADT) and average occupancy factor for all vehicles (FHWA's default is 1.7), which results in person-miles. This calculation is done for reliable segments and for all segments. Dividing the sum of reliable segment person-miles by the sum of all segment person-miles provides the measure of percent of travel time reliability.

State DOTs must also establish 2- and 4-year targets for truck travel time reliability (TTTR) on the Interstate System. This measure is calculated similarly to the LOTTR-based measures, but the metric's parameters are slightly different and it is not translated into a percentage of reliable person-miles. This measure also uses a subset of the NPMRDS data that contains only truck data, rather than all-vehicle data.

The TTTR index is the metric for determining the performance measure. The TTTR index is calculated for five time periods:

1. Weekdays from 6:00 a.m. – 10:00 a.m.
2. Weekdays from 10:00 a.m. – 4:00 p.m.
3. Weekdays from 4:00 p.m. – 8:00 p.m.
4. Overnight (all days) from 8:00 p.m. – 6:00 a.m.
5. Weekends from 6:00 a.m. – 8:00 p.m.

Data for truck traffic are analyzed based on 15-minute bins of speeds and travel times for TMCs. For each time period across an entire year, the TTTR is defined as the ratio of the longer truck travel time (95th percentile) to a "normal" truck travel time (50th percentile). For each TMC, the highest TTTR value from the five time periods is carried forward into the measure calculation. To translate the individual TMC values into the overall TTTR index, the length of each segment is multiplied by its maximum TTTR from the five time periods. These length-weighted TTTRs are then added together and divided by the sum of all segment lengths to result in the TTTR index for the performance measure. A lower TTTR index indicates a higher amount of system reliability per the performance measure, with 1.0 being the lowest possible value.

The CATT Lab tool provides output necessary for the state DOT's required data submission to the Highway Performance Monitoring System (HPMS), including the LOTTR and TTTR metrics for each TMC for each time period. The tool also provides the overall LOTTR and TTTR for the state or MPO on an annual and monthly basis. The monthly output helps shown seasonal patterns in reliability, but there is not a clear statistical relationship between the monthly and annual data because in each case the percentiles are being calculated based on all travel time bins within the timeframe being evaluated. During the prior performance period, with only one initial year of data to review, it was hypothesized that the monthly variance could be used as a proxy for annual variance. With several additional years of data now available, there does not appear to be a strong correlation between the monthly and annual data, and it was decided to modify the target setting approach for the current performance period accordingly.

To develop targets, annual performance from 2017-2021 was reviewed. This showed that Iowa consistently has extremely high reliability per these measures, but there are minor variations on an annual basis. A review of unreliable Interstate TMCs per the LOTTR metric showed that they were typically associated with one or more of three categories: major work zones, high volume commuter corridors, and data errors. The third category has improved over time as the dataset has been refined and additional quality checks have been conducted. A review of unreliable non-Interstate NHS segments showed that the majority occur in urban areas (over 5,000 population), which makes sense given that these areas will have more corridors with slower speeds, more commuter traffic, traffic control devices, and other urban characteristics that can impede traffic. A review of Interstate TTTR data has shown the most significant impact during this timeframe was the extreme flooding in western Iowa in 2019, which resulted in repeated closures of I-29 for weeks or months in some locations.

Iowa DOT decided to set targets that are conservative relative to past performance, but that still represent extremely high system reliability. This allowed for fluctuations in reliability due to issues like major work zones and unanticipated events such as closures due to extreme weather or natural disasters.

Current Status

Figure 1 shows the historical performance and targets for travel time reliability for both the Interstate System and the non-Interstate NHS. Figure 2 shows the historical performance and targets for the truck travel time reliability index for the Interstate System. Table 1 summarizes Iowa DOT's PM3 targets. The 2- and 4-year targets were held constant. A review of the data at the midpoint of the performance period showed that system reliability continues to be high. No changes are proposed for the 4-year targets.

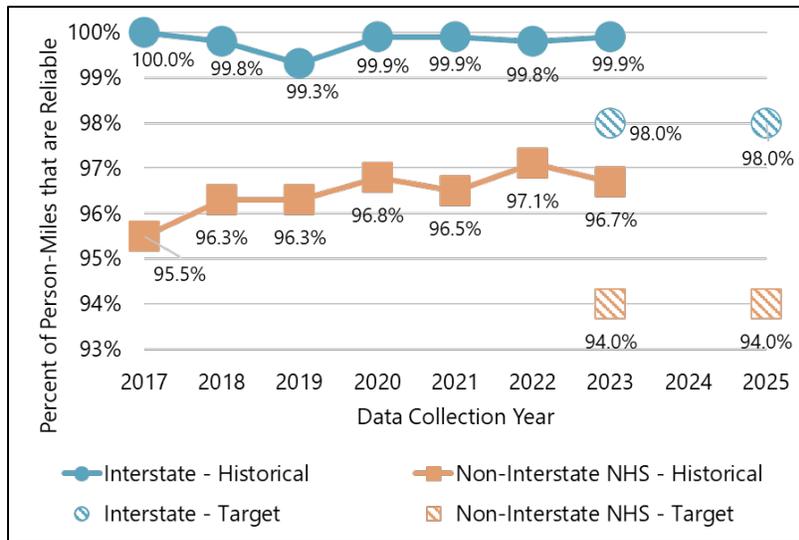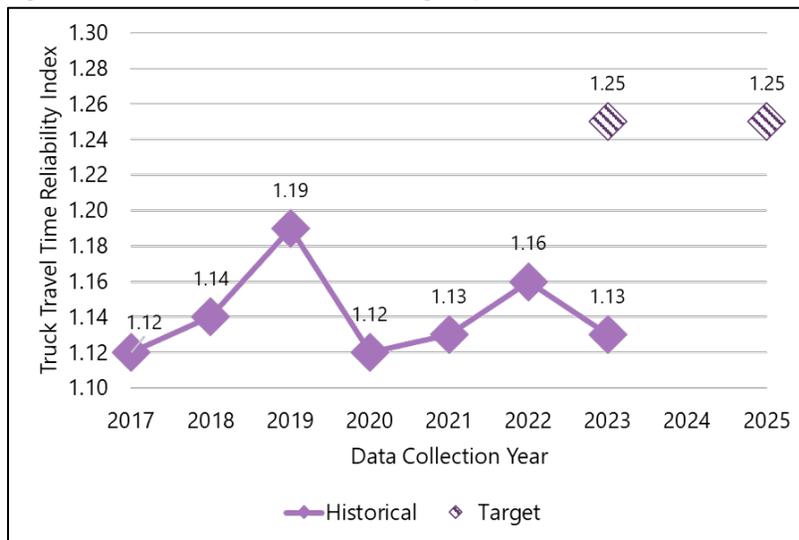*Figure 1: Historical condition and targets for Interstate and non-Interstate NHS travel time reliability*

Figure 2: Historical condition and targets for Interstate truck travel time reliability index

(lower value = higher reliability)

Table 1: Iowa DOT PM3 targets for 2022-2025

Measure	2021 Baseline	2023 2-Year Target	2023 2-Year Actual	*2025 Prior 4-Year Target*	2025 Proposed 4-Year Target
Interstate % Reliable	99.9%	98.0%	99.9%	*98.0%*	98.0% (No change)
Non-Interstate NHS % Reliable	96.5%	94.0%	96.7%	*94.0%*	94.0% (No change)
Interstate Truck Travel Time Reliability	1.13	1.25	1.13	*1.25*	1.25 (No change)

Note: the years represent the calendar year in which data was collected. Data is reported through the HPMS the following year; e.g., the baseline data for CY 2021 was reported to the HPMS in CY 2022.

Iowa DOT 2022-2025 PM3 Targets – Status Update