

National Performance Measures: Initial target-setting

Performance Management
Connecticut Department of Transportation



Timeline to May 20, 2018

DATE	MILESTONE
April 16	Executive reviews recommended state performance targets
April 30	Initial TAMP (Transportation Asset Management Plan) due to FHWA
May 8	Meeting with MPOs to present proposed targets and coordinate to “maximum extent possible”
May 20	State DOT establishes performance targets
Oct 1	State DOT formally submits targets to FHWA
Nov 20	MPOs establish performance targets



Targets to be established

- Pavement condition (4)
- Bridge condition (2)
- System reliability (2)
- Freight movement (1)
- Air quality (1)



Target-setting considerations

- Target-setting methodology (maturity)
- Top risks in adopting the target
- Confidence in achieving target



Target-Setting Maturity Model

4. Systems approach ◆

Systems techniques (simulation, system dynamics)
& cause-effect relationship

Systems

3. Forecasting model ◆

Include explanatory variables/covariates in a model, forecast outcome

Models

2. Extrapolation ◆

Use historical time series and extend into future

Extrapolation

1. Aspirational ◆

Target based on desired outcome, little data used

Aspirational



Risks

- **Where are our headaches going to come from?**
 - Insufficient investment → declining targets
 - Abstract target definitions
 - Perception (headlines)
- **We should have a strategy to address the risks**
 - Develop a communications strategy (telling our story first)



Confidence

- **Are we confident we achieve the targets?**

Confidence is higher with:

- **More and better data**
- **Better understanding, more powerful models**
- **Control over outcomes**



Bridge Condition Measures

- % of NHS Bridges in “Good” and “Poor” condition
- Max % poor: 10 (MAP-21)

Asset (unit of measure)	Current Condition (NBI submittal 3/2017)		2-year targets (2020)		4-year targets (2022)	
	Good %	Poor %	Good %	Poor %	Good %	Poor %
NHS Bridge (deck area)	18.1	15.0	22.1	7.9	26.9	5.7

MATURITY	TOP RISK(S)	CONFIDENCE
Forecasting/Systems 3.5	1. Budgetary uncertainty 2. Resource constraints 3. Project delivery	High

Consequences of not making progress toward target: BRIDGE

- **Loss of flexibility in programming funds**
- **Must document actions that will be taken to achieve targets in next period**



Pavement Condition Measures

- % of Interstate system in “Good” and “Poor” condition
 - **MAX % Poor (Interstates): 5%**
- % of National Highway System in “Good” and “Poor” condition

Asset (unit of measure)	Current Condition (HPMS submittal 6/2017)		2-year targets (2020)		4-year targets (2022)	
	Good %	Poor %	Good %	Poor %	Good %	Poor %
Interstate Pavement (lane miles)	66.2	2.2	65.5	2.0	64.4	2.6
Non-Interstate NHS Pavement (lane miles)	37.9	8.6	36.0	6.8	31.9	7.6

MATURITY	TOP RISK(S)	CONFIDENCE
Forecasting/Systems 3.5	1. Budgetary uncertainty 2. State of Good Repair definition is not captured well 3. Declining targets need to be communicated properly	High

Consequences of not making progress toward target: PAVEMENT

- Loss of flexibility in programming funds
- Must document actions that will be taken to achieve targets in next period

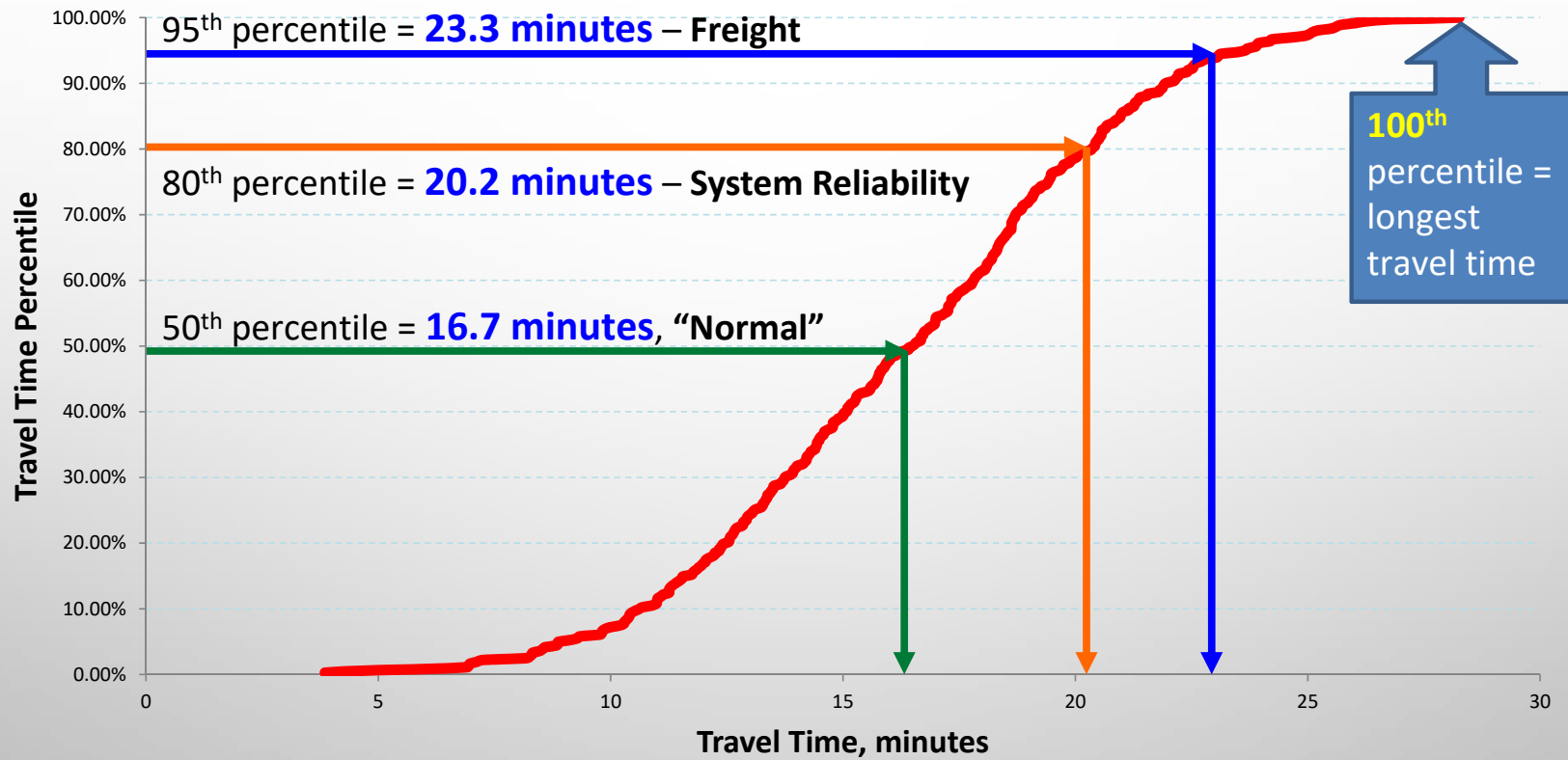


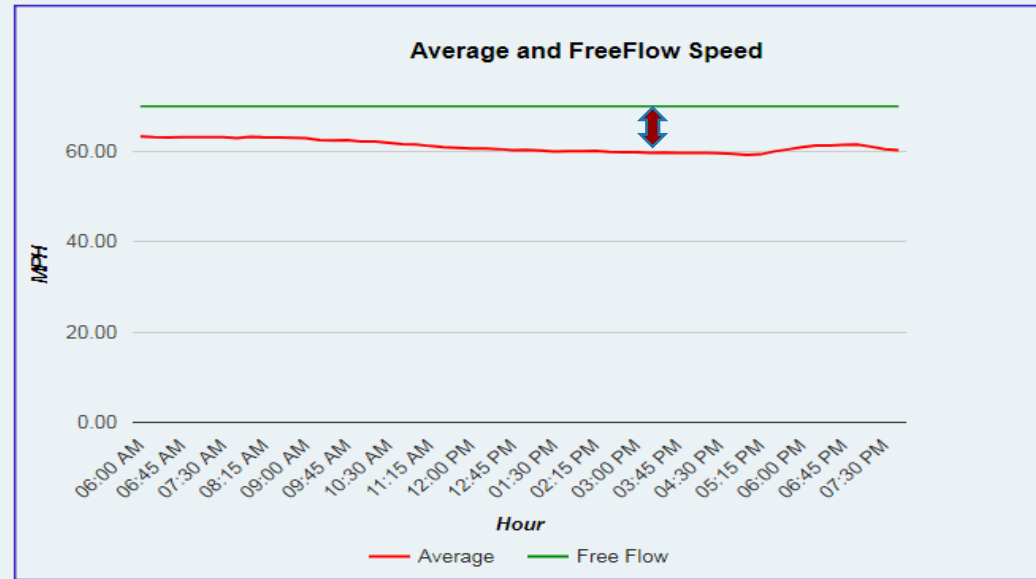
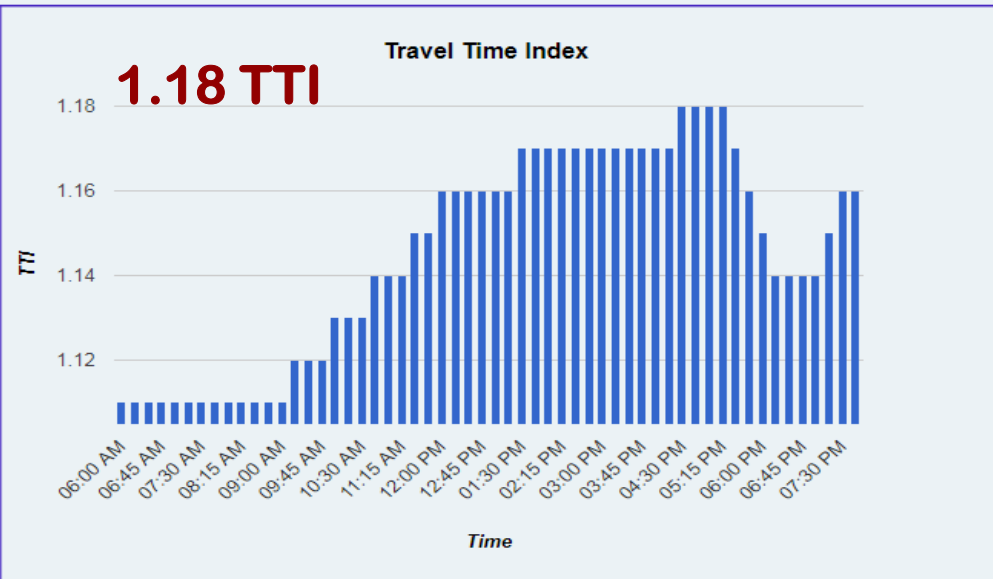
System Reliability: “Level of Travel Time Reliability”

- “Normal” travel time: 50th percentile
- Longest travel time: 100th percentile
- 80th percentile travel time: Worse (longer) than 80% of travelers
- LOTTR: 80th percentile / 50th percentile
- Reliable LOTTR: 80th / 50th percentile travel time < 1.5

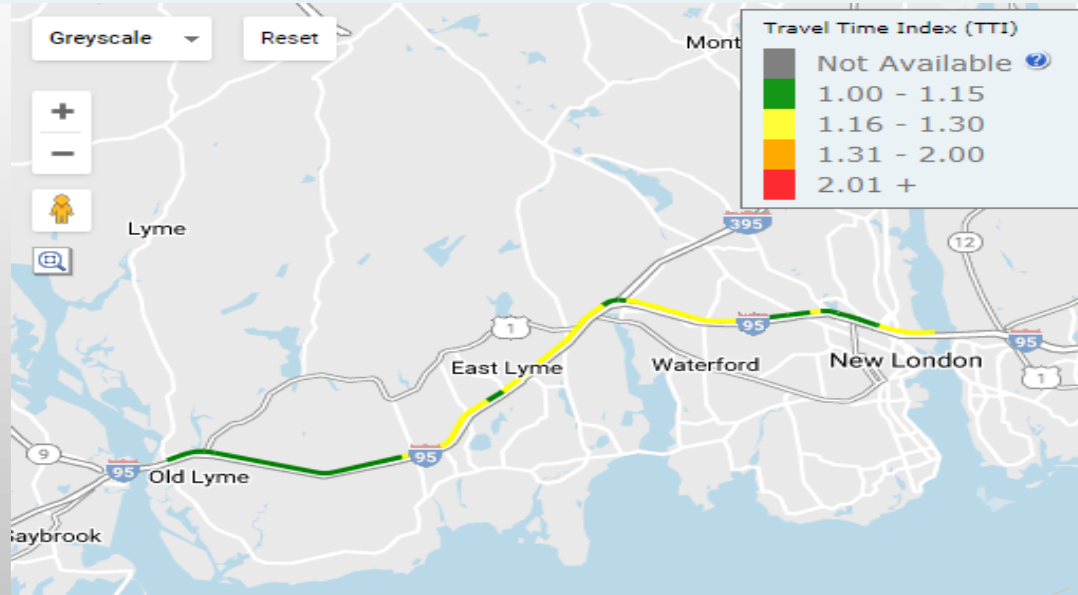


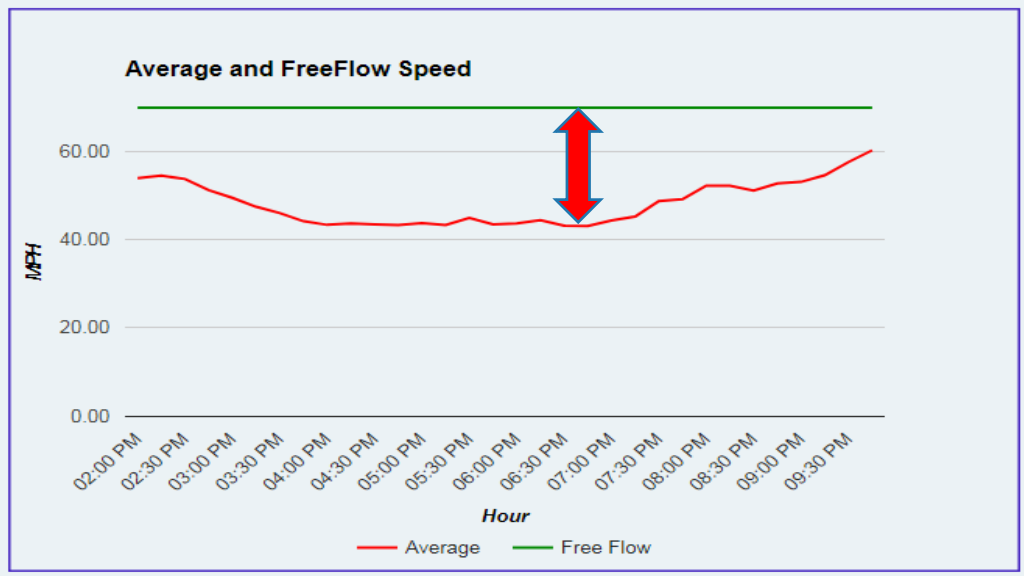
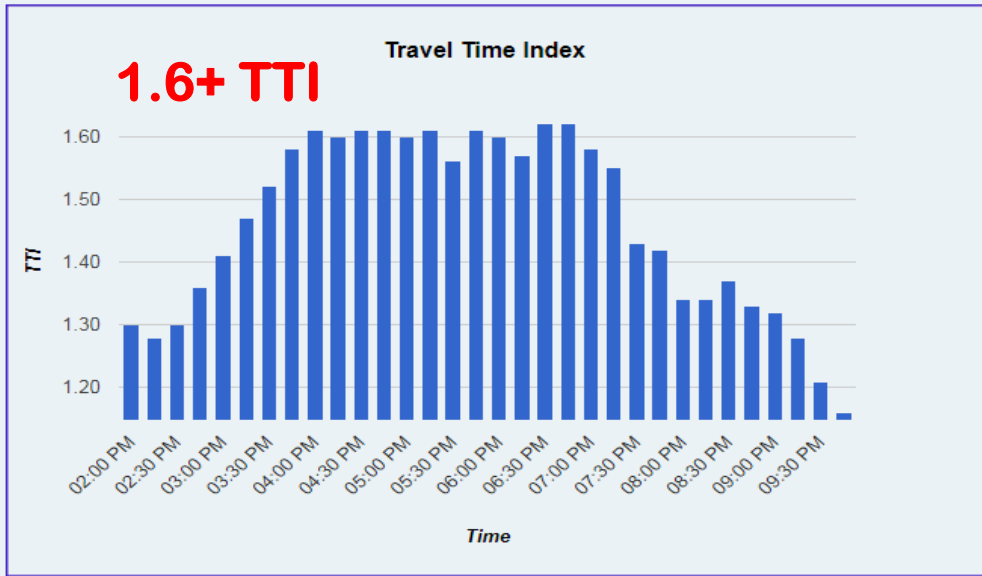
Travel Time: Percentiles



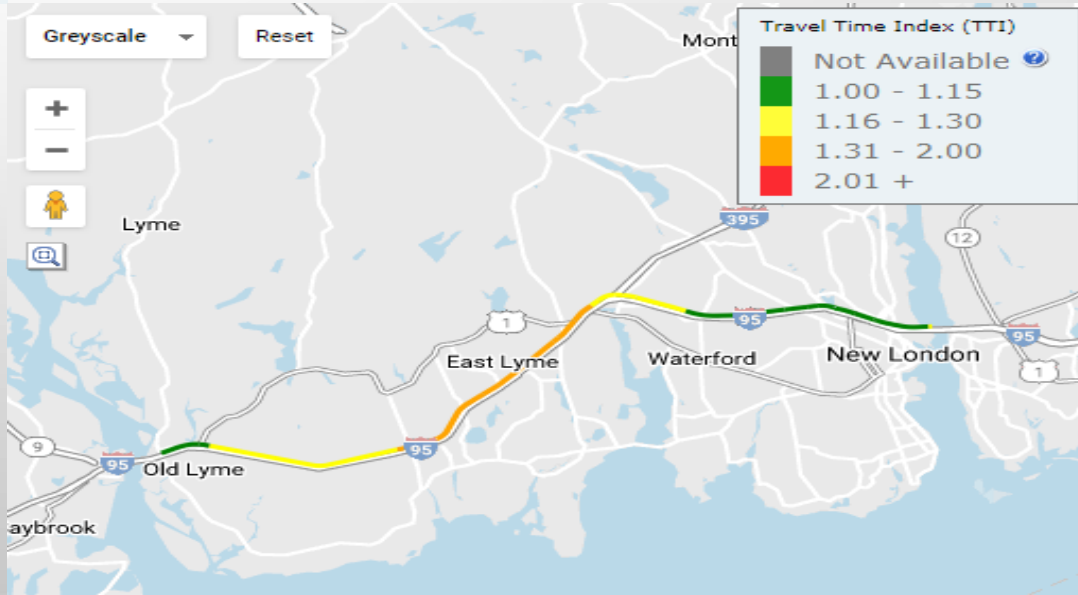


I-95 SOUTHBOUND OLD LYME – NEW LONDON YEAR-ROUND RELIABILITY DATA





I-95 SOUTHBOUND OLD LYME – NEW LONDON AUGUST – SUNDAY PM RELIABILITY DATA



System Reliability Measures

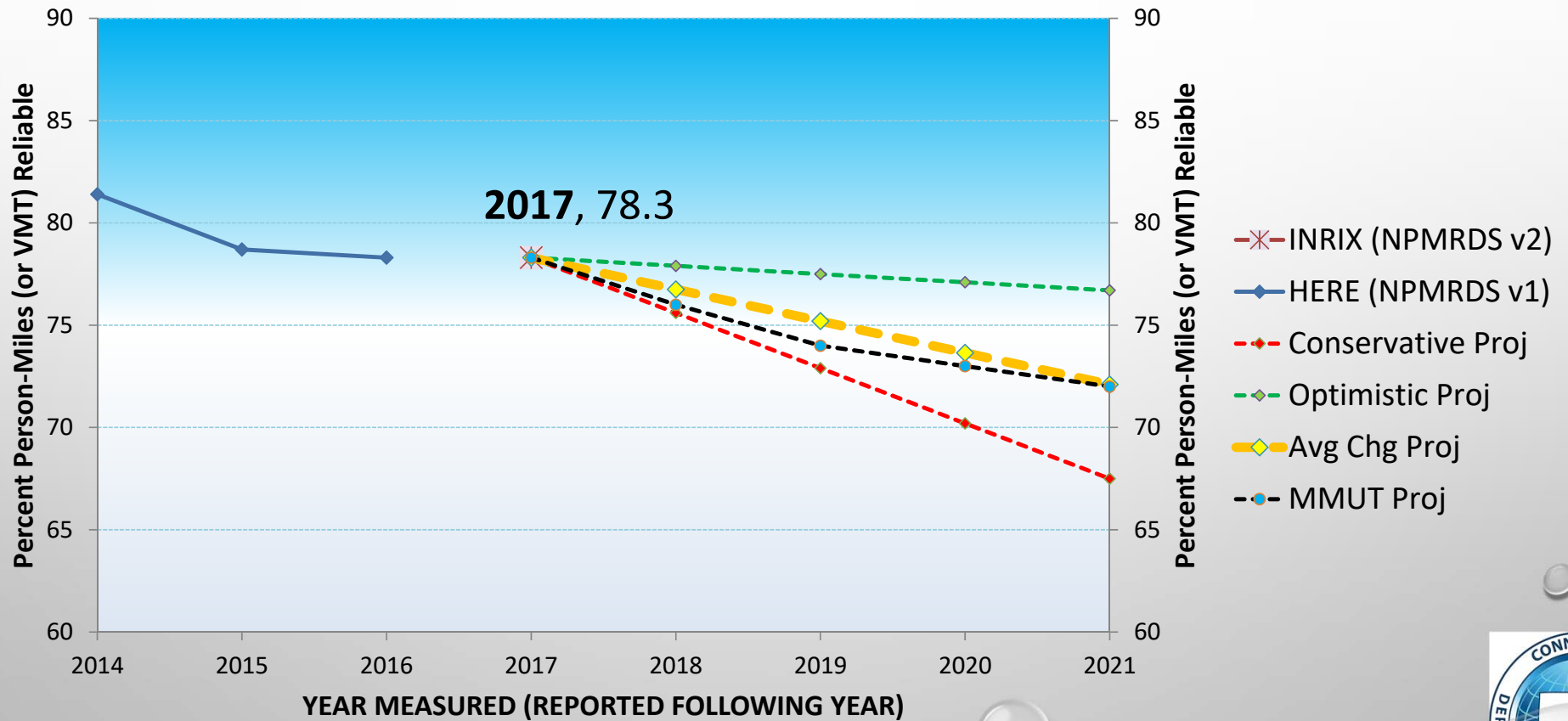
- % person-miles of Interstate that are “reliable”
- % person-miles of non-Interstate NHS that are “reliable”

System (unit of measure)	Current Condition	2-year targets (2020)	4-year targets (2022)
	Reliable %	Reliable %	Reliable %
Interstate (person-miles)	78.3	75.2	72.1
Non-Interstate NHS (person-miles)	83.6	80.0	76.4

MATURITY	TOP RISK(S)	CONFIDENCE
Aspirational/ Extrapolation 1.5	<ol style="list-style-type: none"> 1. Reliability definition new, abstract, and may not capture individual user experience 2. Outcomes subject to external factors 3. Worsening reliability has to be communicated 	Low

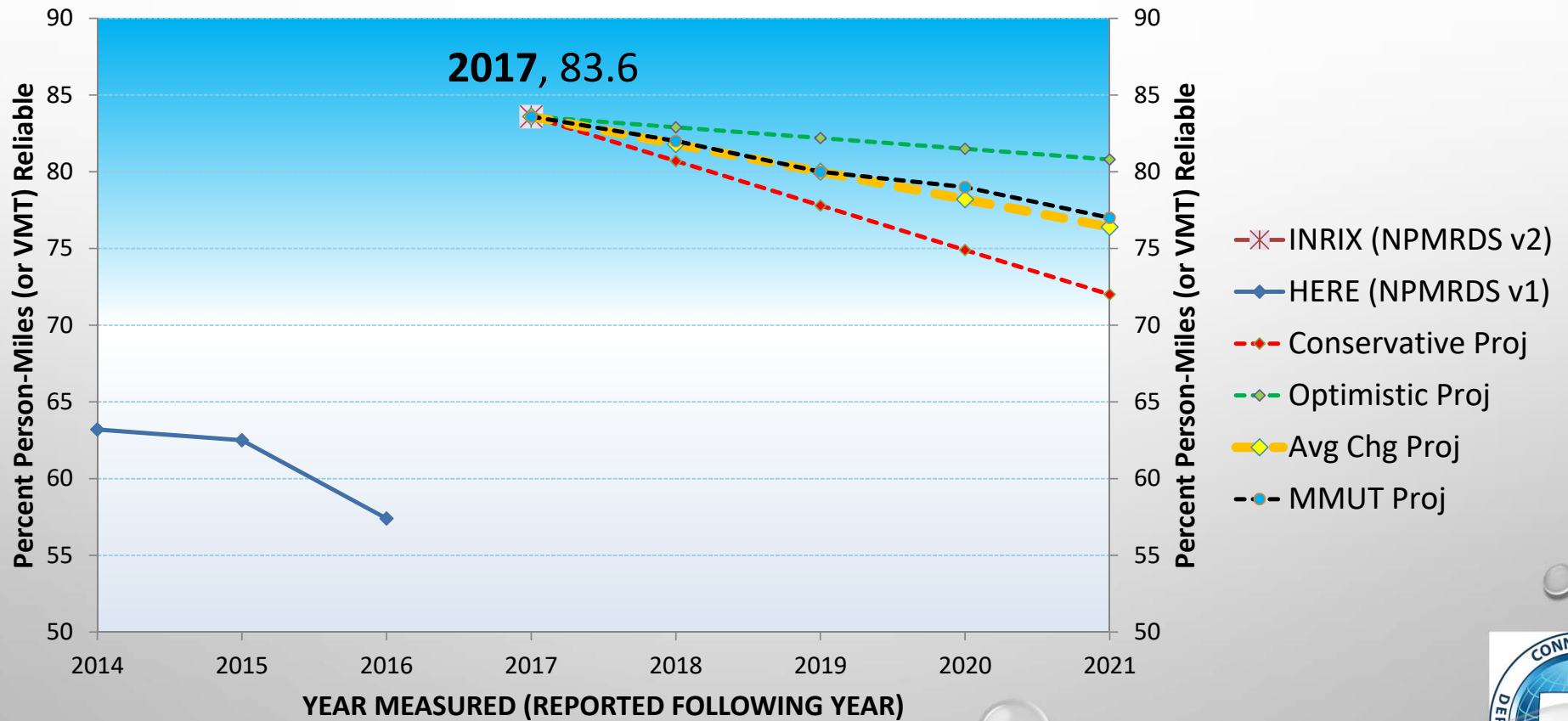
INTERSTATE System Reliability

(Percent person-miles traveled that are reliable)



NON-INTERSTATE NHS System Reliability

(Percent person-miles traveled that are reliable)



Consequences of not making progress toward target: **SYSTEM RELIABILITY**

- “State DOTs that fail to meet or make significant progress toward targets in a biennial performance reporting period will be required to document the actions they will undertake to achieve their targets in their next biennial performance report.”





Freight Movement Measure

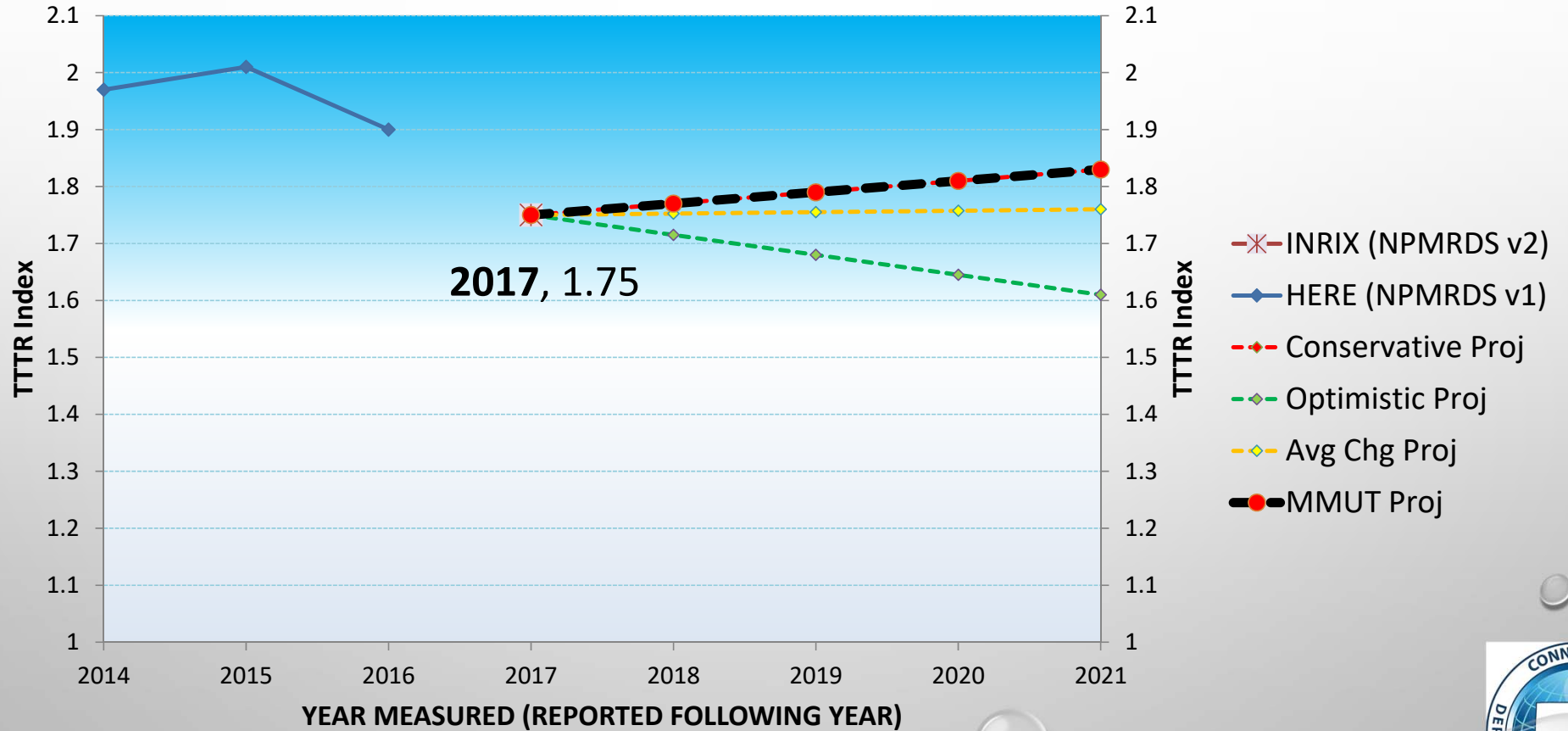
- Truck Travel Time Reliability (TTTR) index

System (unit of measure)	Current Condition	2-year targets (2020)	4-year targets (2022)
	TTTR	TTTR	TTTR
Interstate (Truck Travel Time Reliability Index)	1.75	1.79	1.83

MATURITY	TOP RISK(S)	CONFIDENCE
Aspirational/ Extrapolation 1.5	<ol style="list-style-type: none"> 1. Measure is very abstract and may not reflect individual experience 2. Outcomes subject to external factors 3. Declining reliability has to be explained and communicated 	Low

Freight Movement

INTERSTATE Truck Travel Time Reliability index, TTTR - 95th/50th percentile, maximum over 5 time periods in a week)



Consequences of not making progress toward target: FREIGHT

- After a 2-year period, documentation of actions to achieve targets is required (as in system reliability).
- The next freight performance report becomes more prescriptive:
 - (i) An identification of significant freight system trends, needs, and issues within the State.
 - (ii) A description of the freight policies and strategies that will guide the freight-related transportation investments of the State.
 - (iii) An inventory of truck freight bottlenecks within the State and a description of the ways in which the State DOT is allocating funding under title 23 U.S.C. to improve those bottlenecks.
 - (A) The inventory of truck freight bottlenecks shall include the route and milepost location for each identified bottleneck, roadway section inventory data reported in HPMS, Average Annual Daily Traffic (AADT), Average Annual Daily Truck Traffic (AADTT), Travel-time data and measure of delay, such as travel time reliability, or Average Truck Speeds, capacity feature causing the bottleneck or any other constraints applicable to trucks, such as geometric constraints, weight limits or steep grades.
 - (B) For those facilities that are State-owned or operated, the description of the ways in which the State DOT is improving those bottlenecks shall include an identification of methods to address each bottleneck and improvement efforts planned or programmed through the State Freight Plan or MPO freight plans; the Statewide Transportation Improvement Program and Transportation Improvement Program; regional or corridor level efforts; other related planning efforts; and operational and capital activities.
 - (iv) A description of the actions the State DOT will undertake to achieve the target established for the Freight Reliability measure in § 490.607.
- (3) The State DOT should, within 6 months of the significant progress determination, amend its Biennial Performance Report to document the information specified in this paragraph to ensure actions are being taken to achieve targets.



Air quality measure: State Total Emissions Reduction

- Emissions reduction is *cumulative*
 - Achieved reductions continue to impact actual emissions as long as improvement project is in place
- MAP-21 measure captures *rate of change* in emissions reduction
 - “First derivative” → more difficult to visualize
 - “Slowing growth in emissions reduction” is expressed as a *negative* rate of change
 - Benefits are counted only on the year funds are first obligated



Air quality measure: State Total Emissions Reduction

- **Emissions (kg)**
 - If we reduce emissions in a project, there is always a lower quantity of pollutants in the air because the project was built
- **Emissions reduction (kg/day)**
 - Each day that the project is in place, emissions are lower by x number of kilograms of pollutants
- **Rate of change of emissions reduction (kg/day/time)**
 - This is the CMAQ measure: A positive number means we are reducing pollutants faster than in a previous period

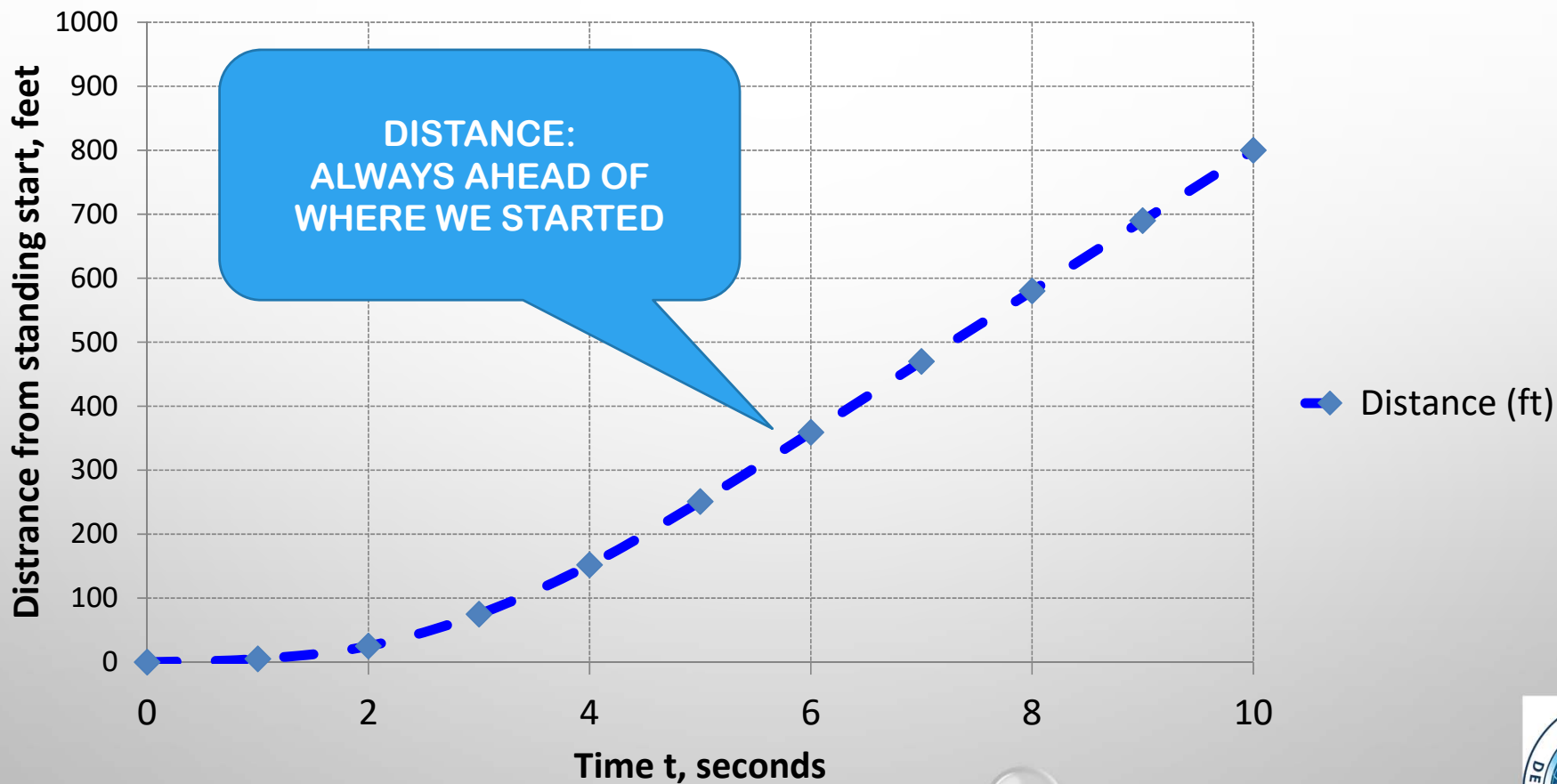


Emissions reduction analogy

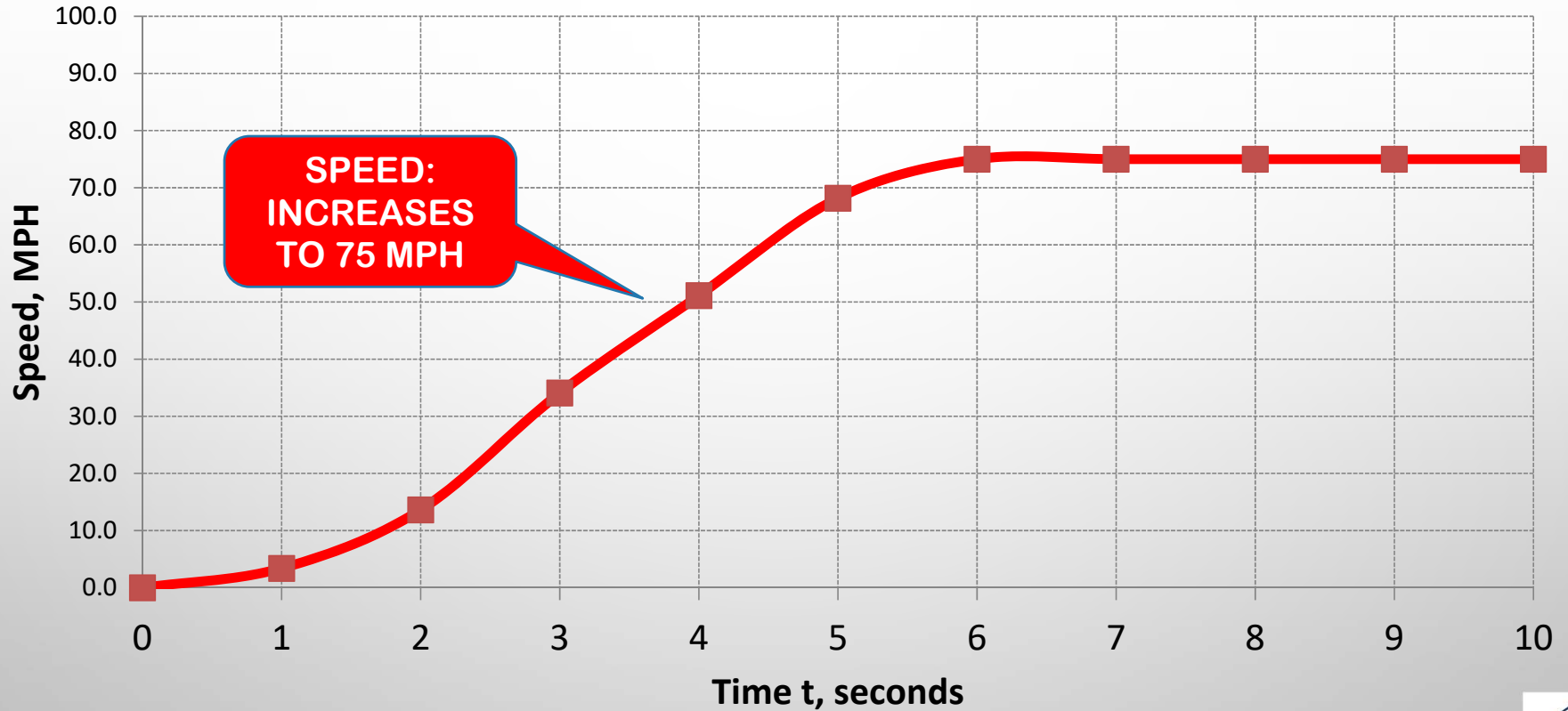
EMISSIONS	A CAR STARTING FROM ZERO TO 75 MPH
<p>EMISSIONS: When an emissions reduction project is built, emissions (kilograms) of pollutants are reduced as the project is in place. $kg_2 < kg_1$</p>	<p>DISTANCE: When the car starts and moves forward, we are always ahead of where we started $x_2 > x_1$</p>
<p>EMISSIONS REDUCTION: Each day the project is in place, x kilograms / day of pollutants continue to be reduced $kg/day_2 < kg/day_1$</p>	<p>SPEED: Increases from zero until car achieves cruising speed of 75 MPH We continue position gains; speed plateaus at 75 MPH</p>
<p>RATE OF CHANGE IN EMISSIONS REDUCTION: Are we increasing the rate of reduction in emissions (kg/day) over time? Do we continue to build projects?</p>	<p>RATE OF CHANGE IN SPEED: Acceleration increases from zero and then decreases to zero when the car maintains cruising speed of 75 MPH</p>



Zero to 75 MPH in a quick car: **DISTANCE**



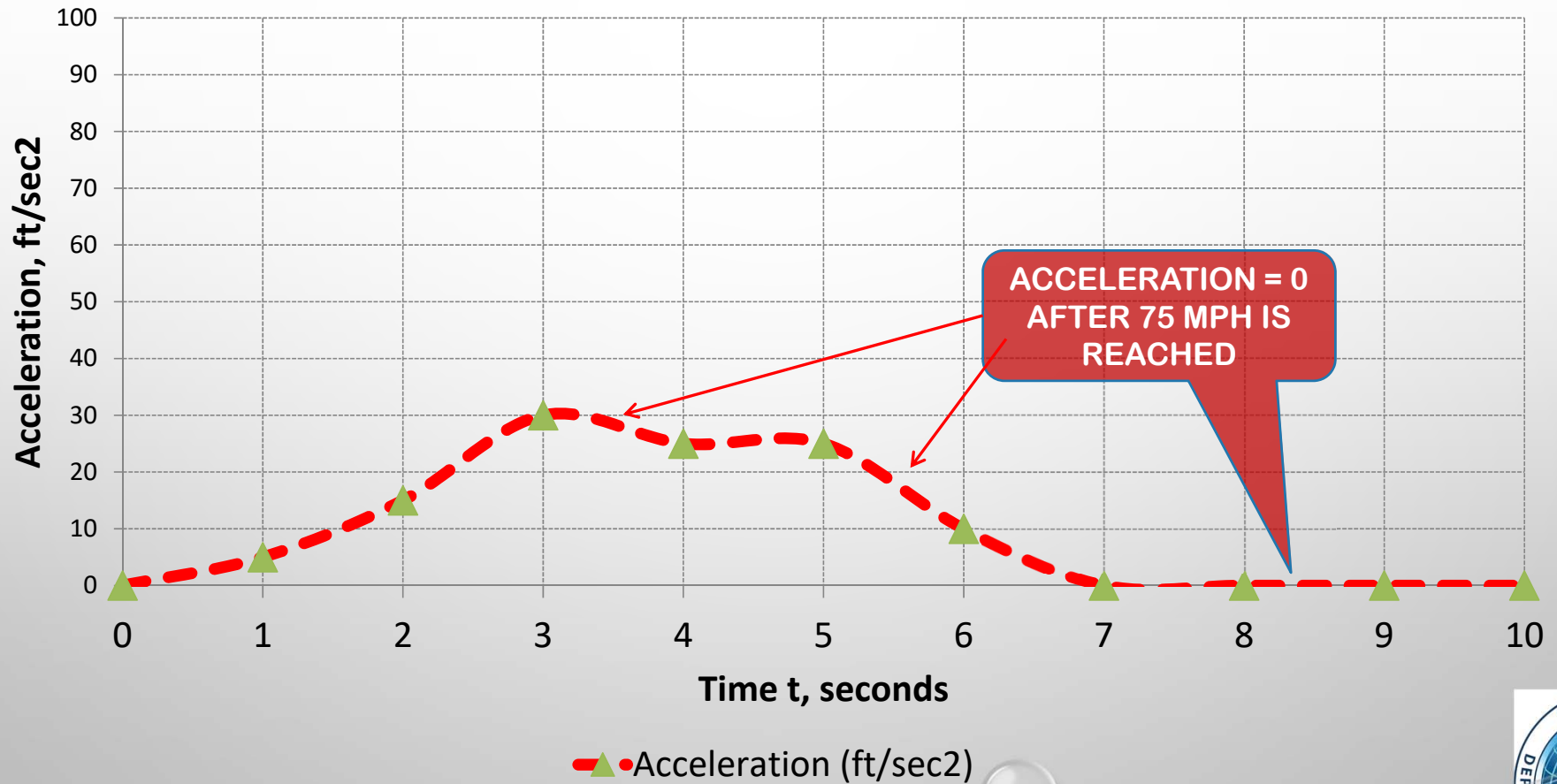
Zero to 75 MPH in a quick car: **SPEED**



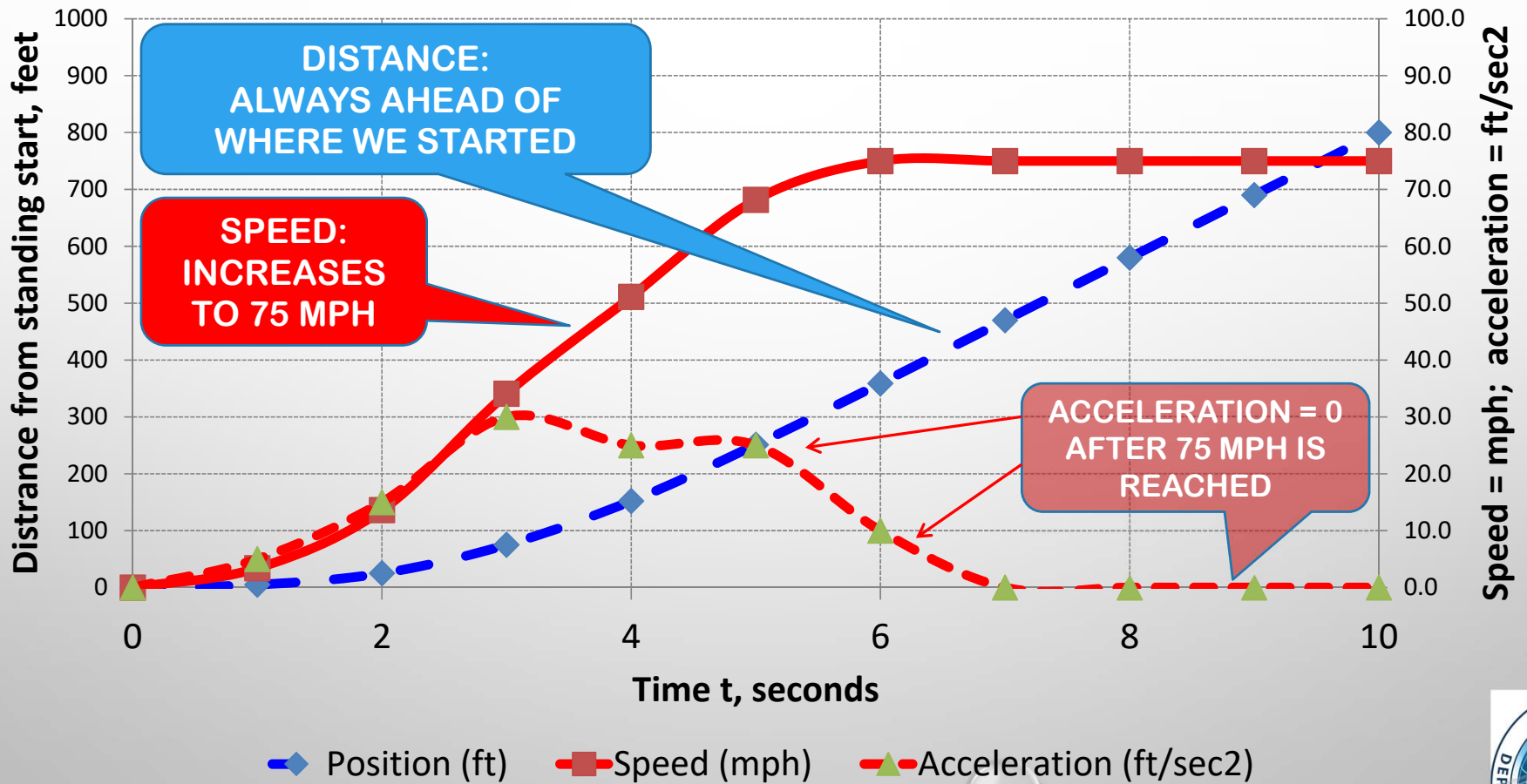
■ Speed (mph)



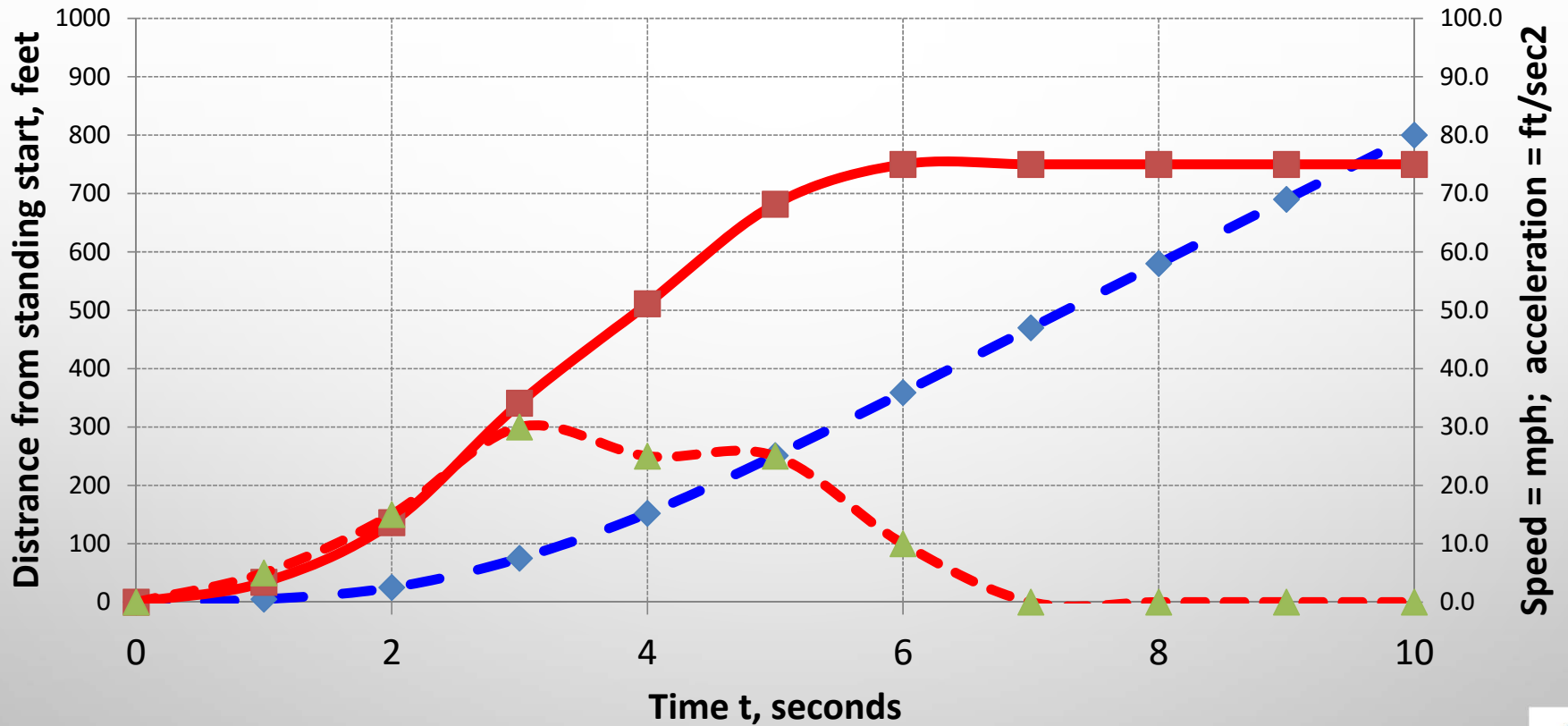
0 to 75 MPH: RATE OF CHANGE IN SPEED (ACCELERATION)



Zero to 75 MPH in a quick car



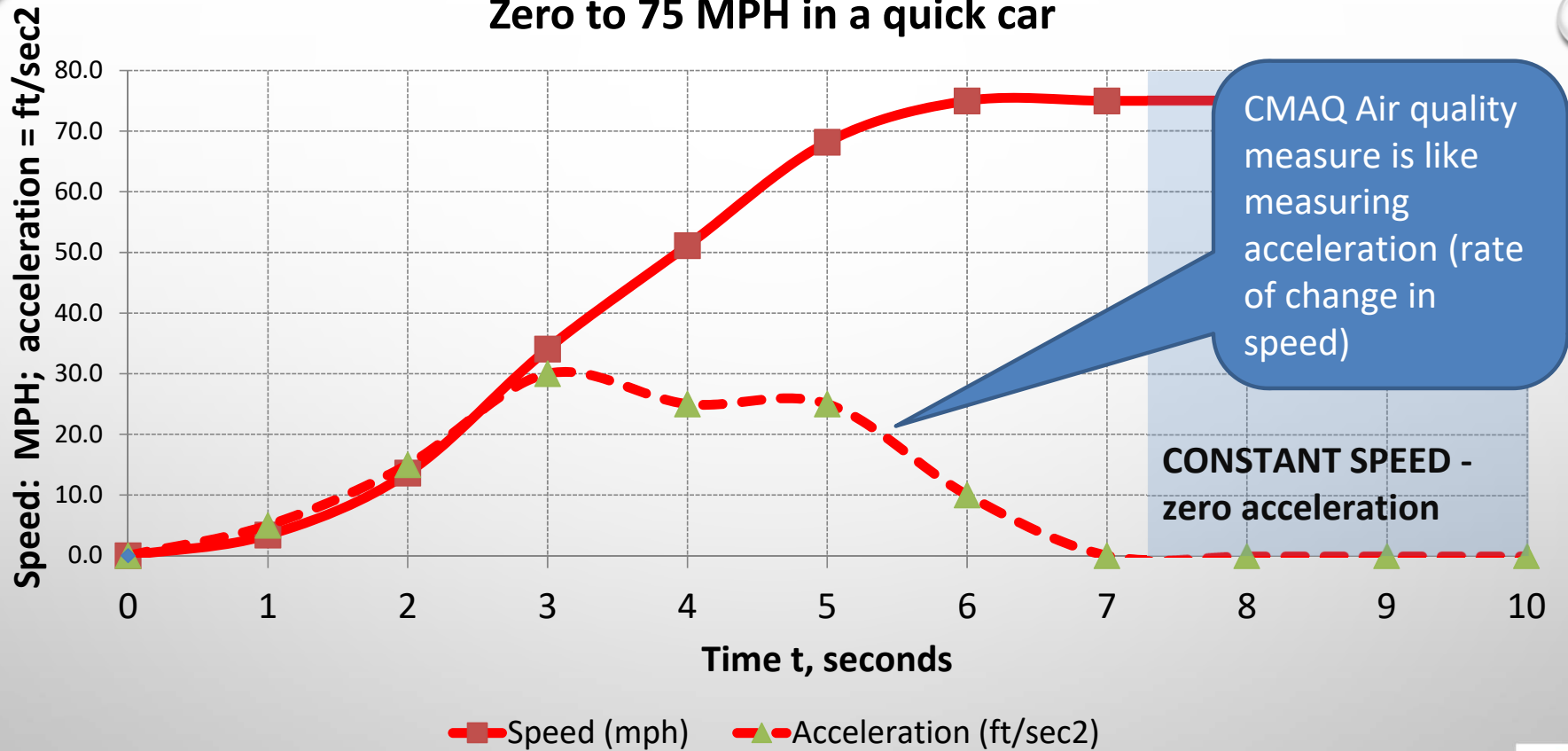
Zero to 75 MPH in a quick car



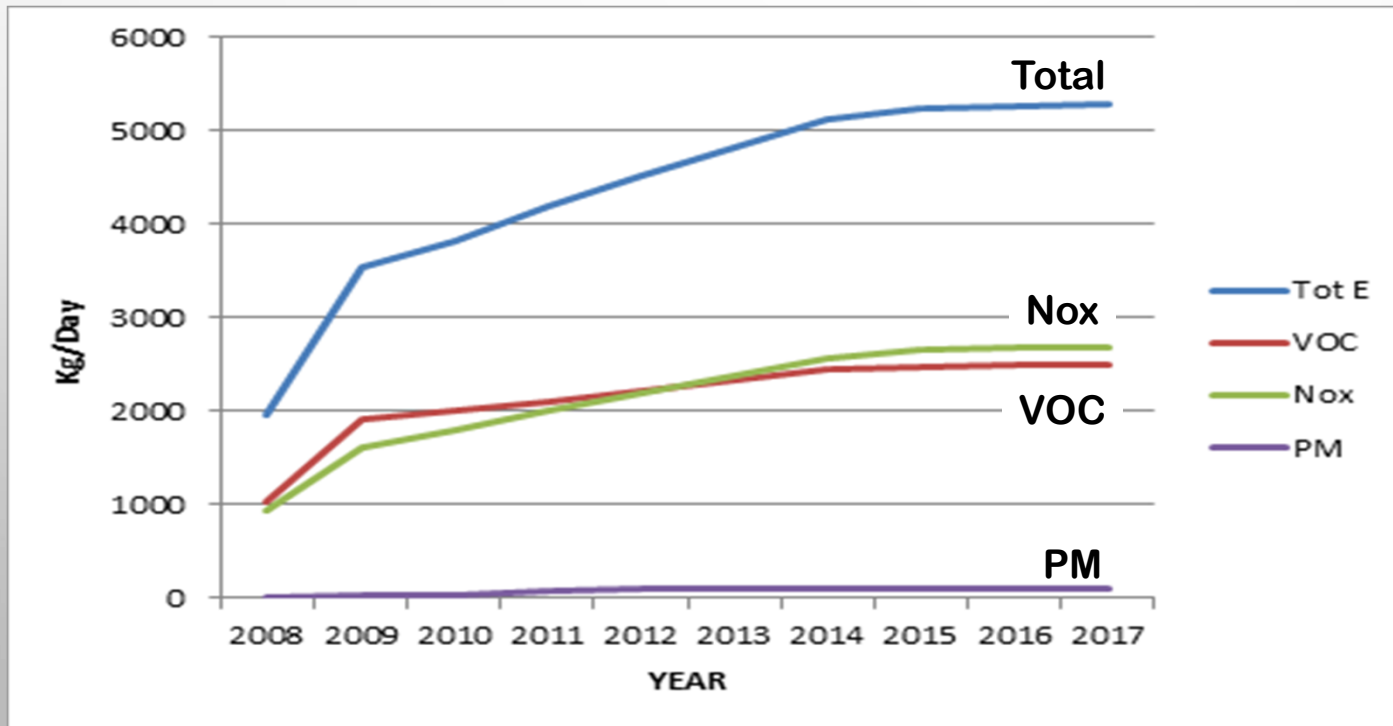
◆ Position (ft) ■ Speed (mph) ▲ Acceleration (ft/sec²)



Zero to 75 MPH in a quick car



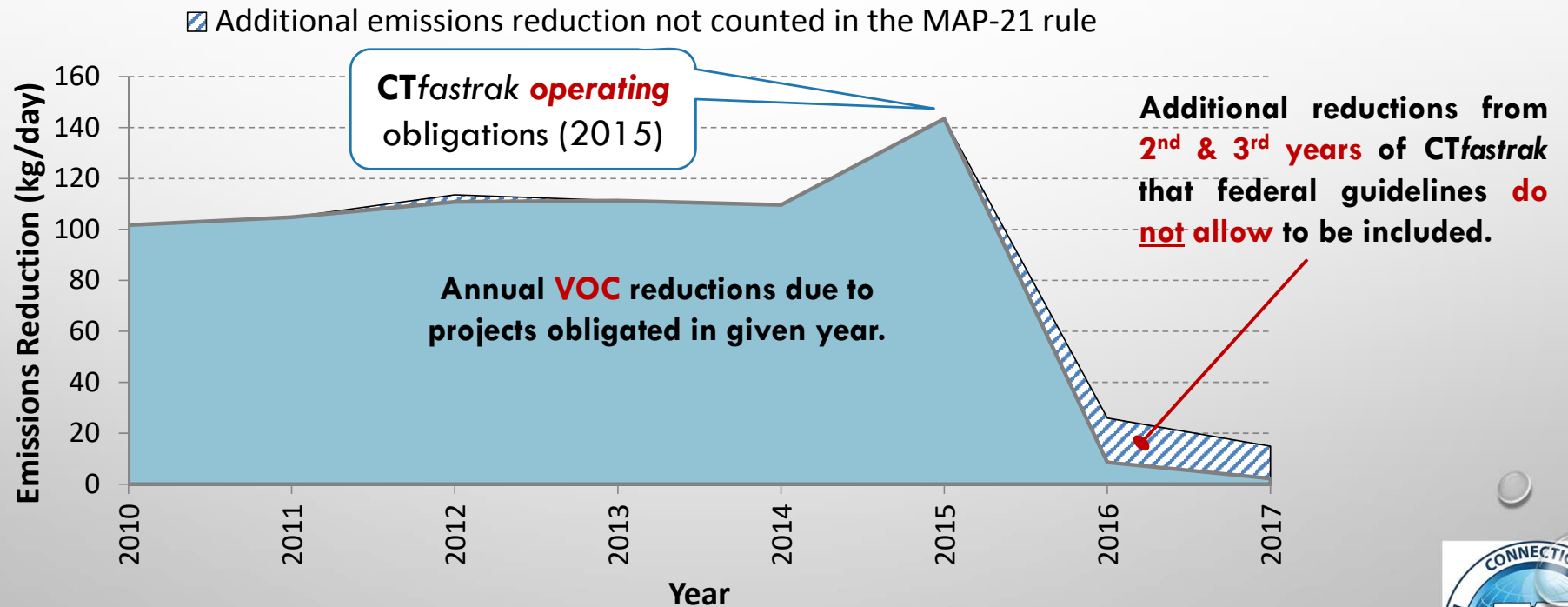
Cumulative Emissions Reductions from CMAQ-funded projects



- Reductions increase
- Rate of change slows down

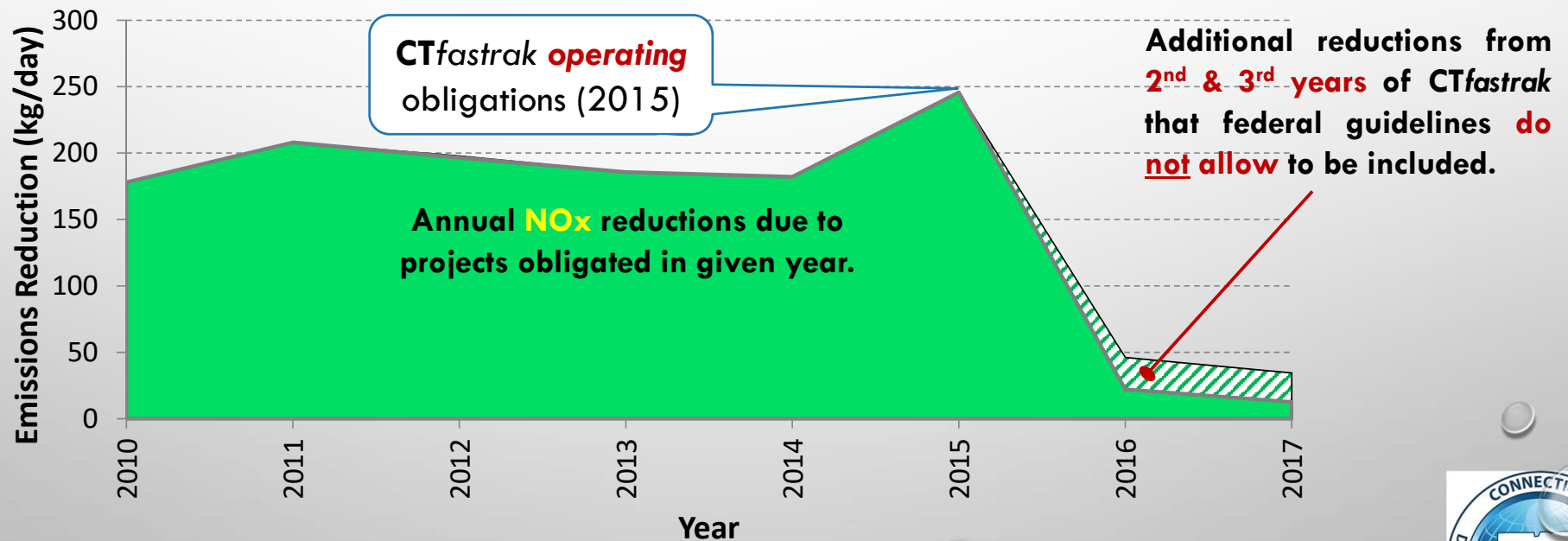


VOC – Rate of Change in Emissions Reduction due to CMAQ obligations for **continuing** projects



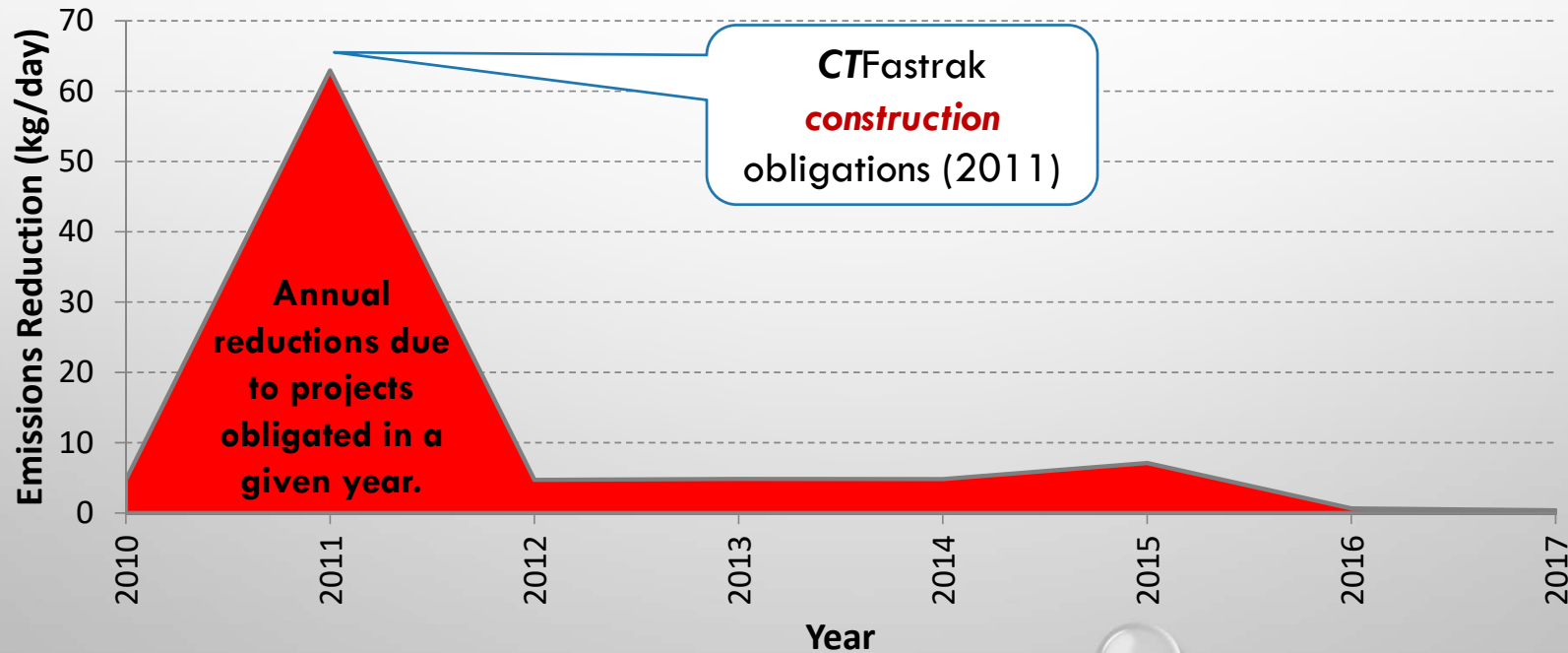
NO_x – Rate of Change in Emissions Reduction due to CMAQ obligations for **continuing** projects

▣ Additional emissions reduction not counted in the MAP-21 rule



PM2.5 – Negligible rate of change in emissions reductions

▣ Additional emissions reduction not counted in the MAP-21 rule



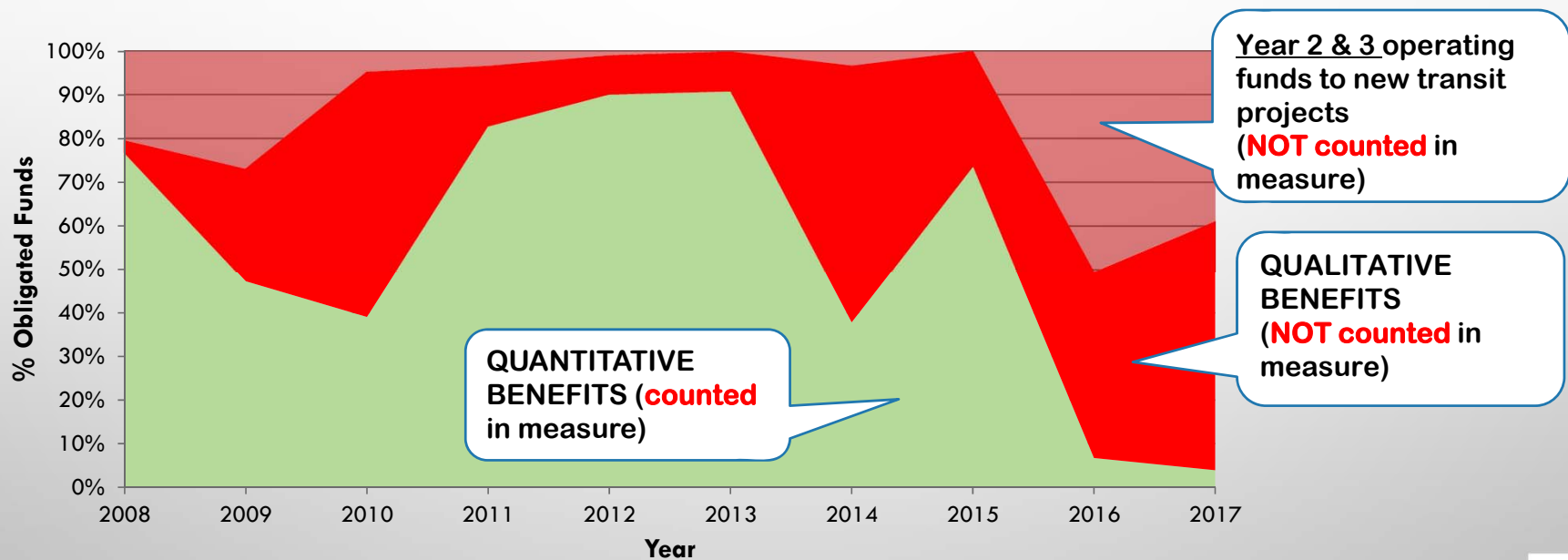
Air quality measure challenges

- **Qualitative benefits not captured in measure**
- **Funding (obligation) variability**
- **Impact of mega-projects on measure**



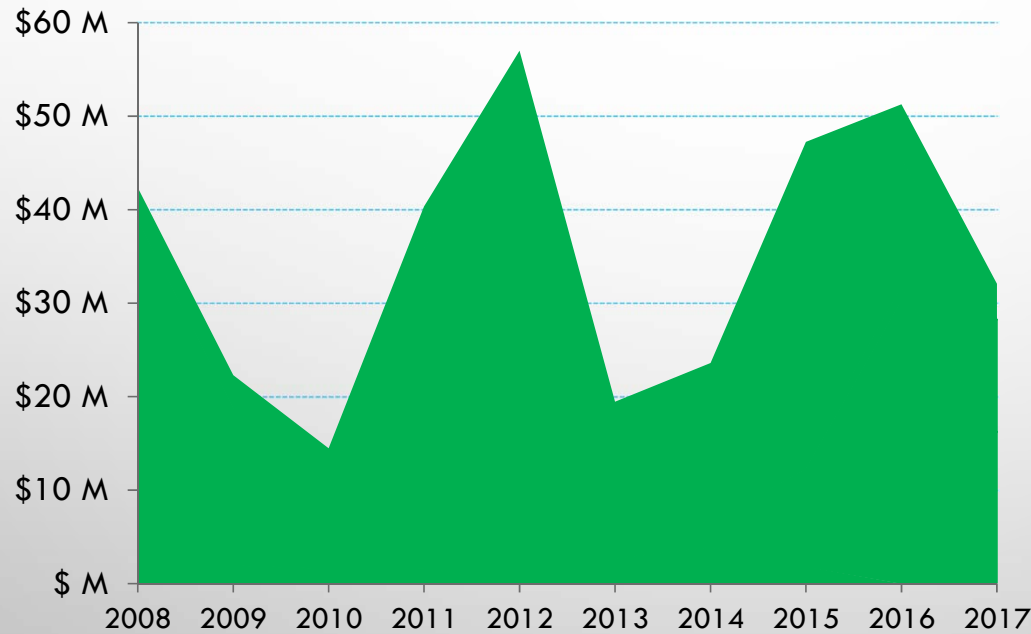
Are benefits counted?

CMAQ Program Investment



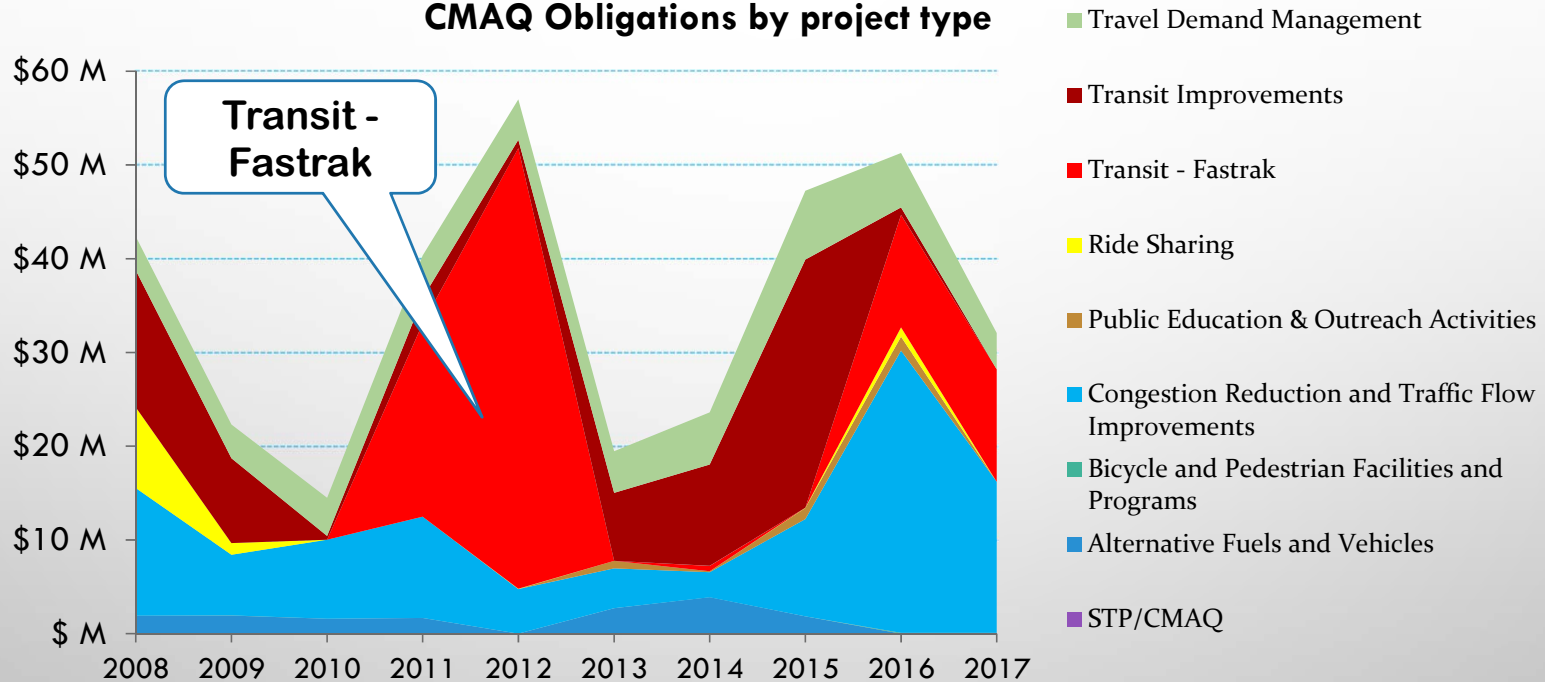
Variability in yearly obligations

CMAQ Obligations by year



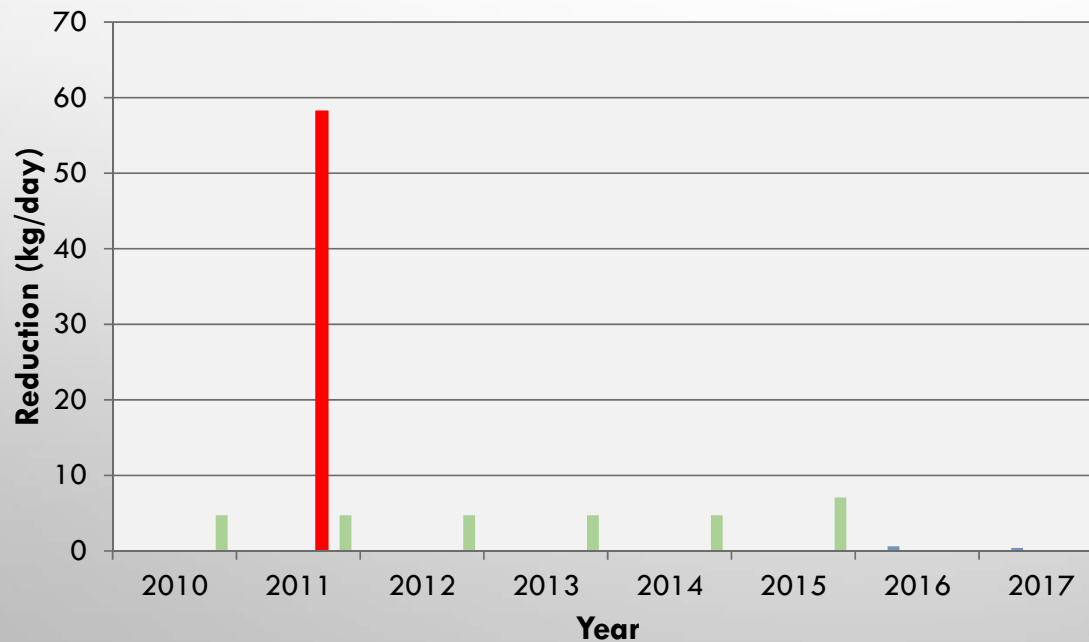
Mega-projects

CMAQ Obligations by project type



Megaprojects

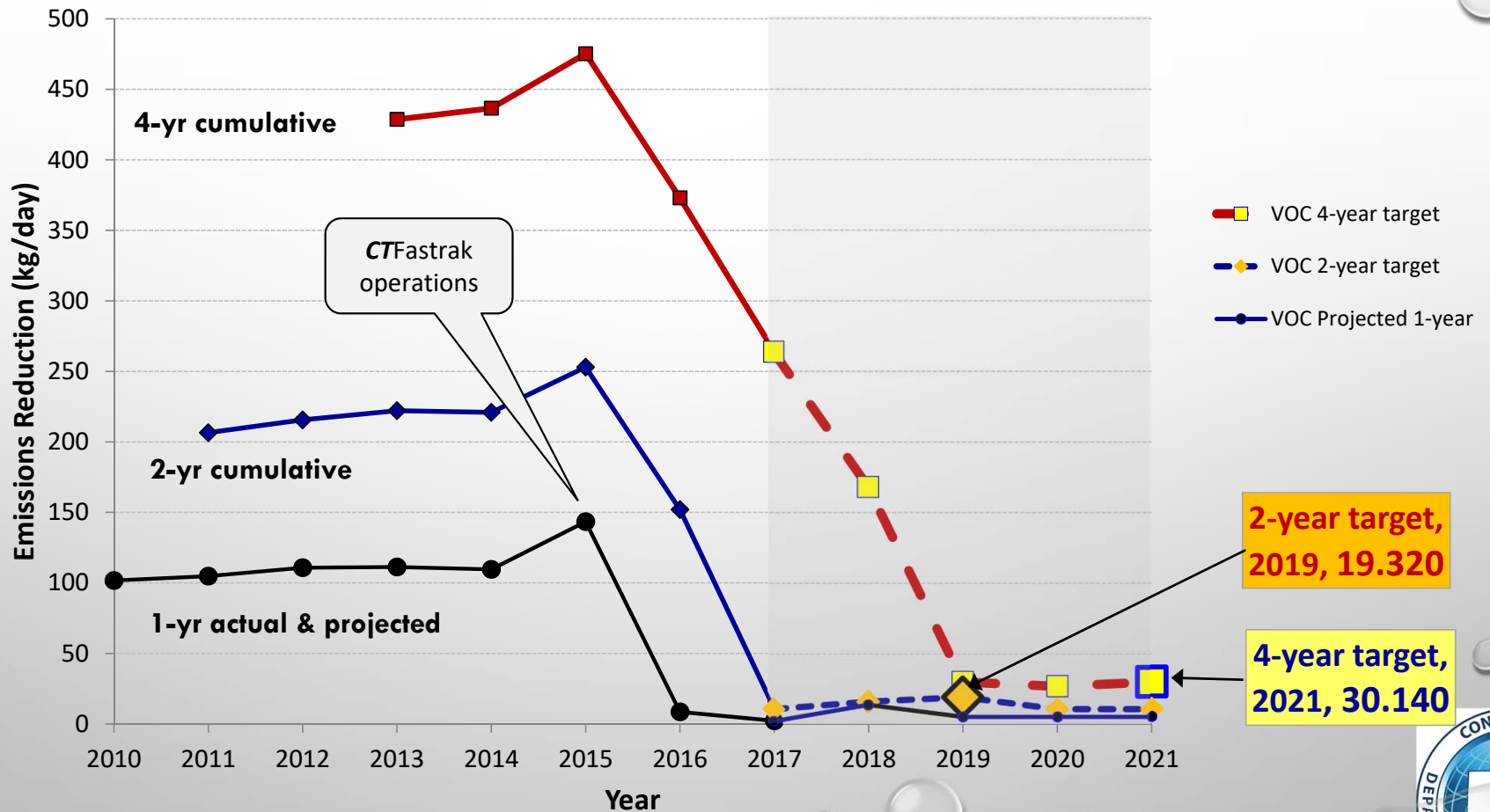
**PM2.5 Reduction by Project type
(Impact of CT Fastrak investment)**



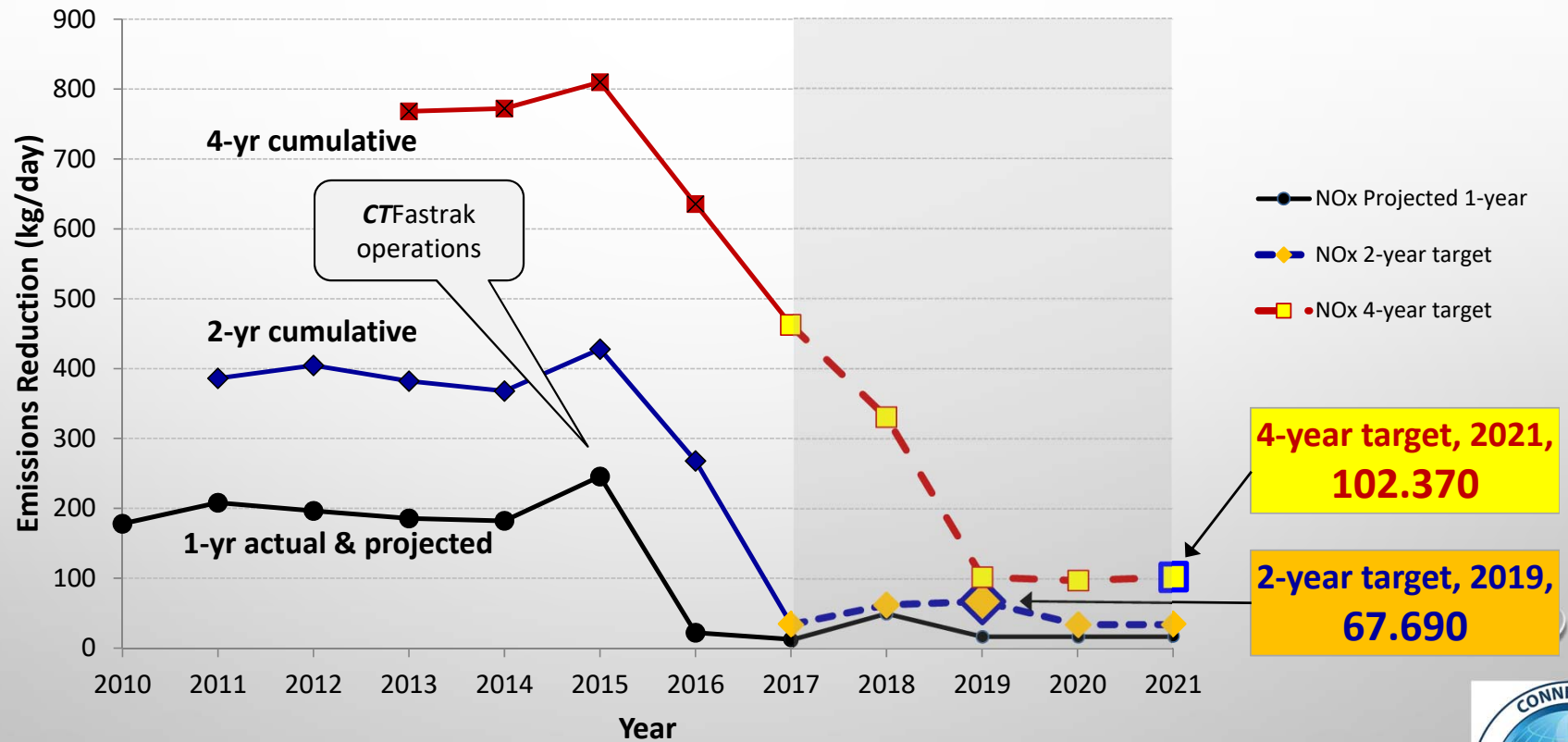
- Alternative Fuels and Vehicles
- Bicycle and Pedestrian Facilities and Programs
- Congestion Reduction and Traffic Flow Improvements
- Public Education & Outreach Activities
- Ride Sharing
- STP/CMAQ
- Transit - Fastrak
- All other Transit Improvements
- Travel Demand Management



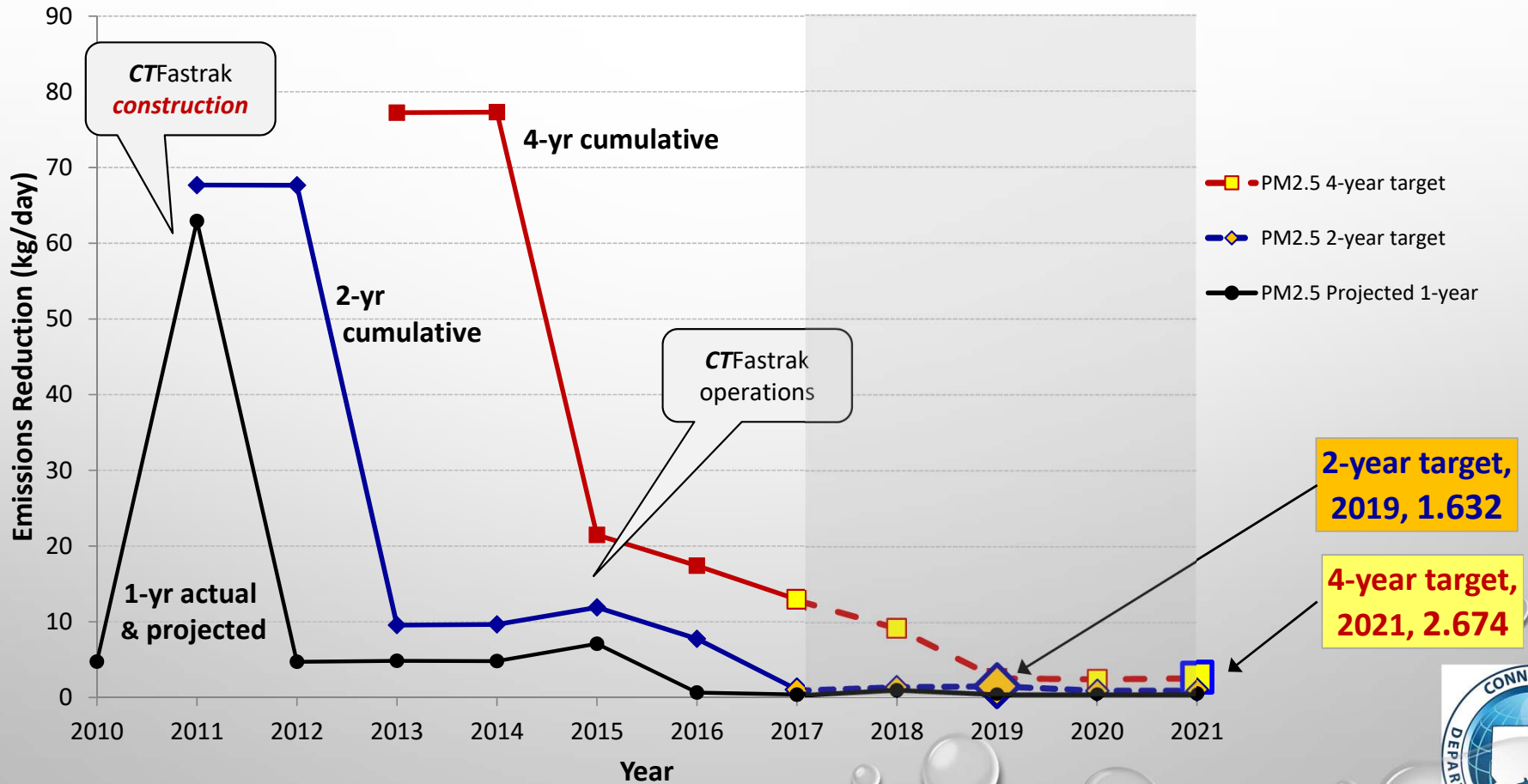
VOC - 2-year cumulative and 4-year cumulative targets for Total Emissions Reduction Measure



NOx - 2-year cumulative & 4-year cumulative targets for total emissions reduction measure



PM2.5 - 2-year cumulative & 4-year cumulative targets for total emissions reduction measure





Air Quality Measure

- Total Emissions Reduction
- From projects entered into the CMAQ Public Access system in previous year

Emissions Component	Current Measurements (CMAQ Public Access as of 2017)		2-year targets (2020)	4-year targets (2022)
	2-year cumulative kg/day	4-year cumulative kg/day	2-year cumulative kg/day	4-year cumulative kg/day
VOC	10.820	263.890	19.320	30.140
NOx	34.680	462.490	67.690	102.370
PM2.5	1.040	12.950	1.632	2.674

MATURITY	TOP RISK(S)	CONFIDENCE
Extrapolation Level 2	<ol style="list-style-type: none"> 1. Qualitative benefits are not captured in measure 2. Given program priorities, quantifiable benefits may appear low with respect to other agencies 	Moderate



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MATURITY	TOP RISK(S)	CONFIDENCE
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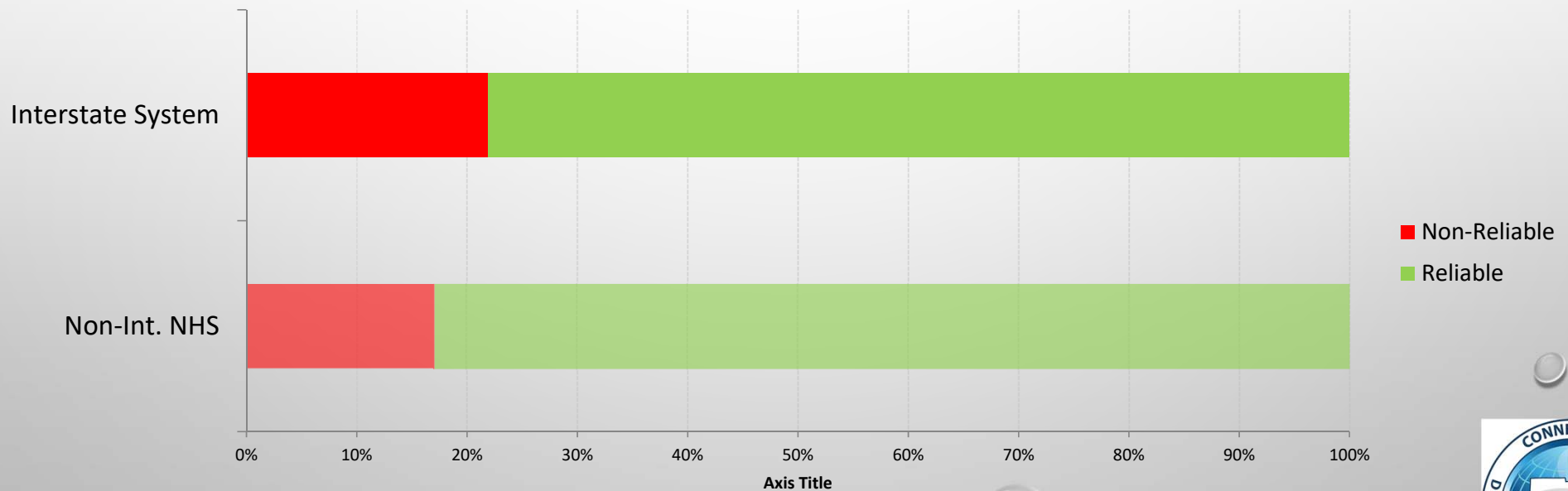
Consequences of not making progress toward target: AIR QUALITY

- Document the actions state will undertake to achieve its targets in their next biennial performance report.



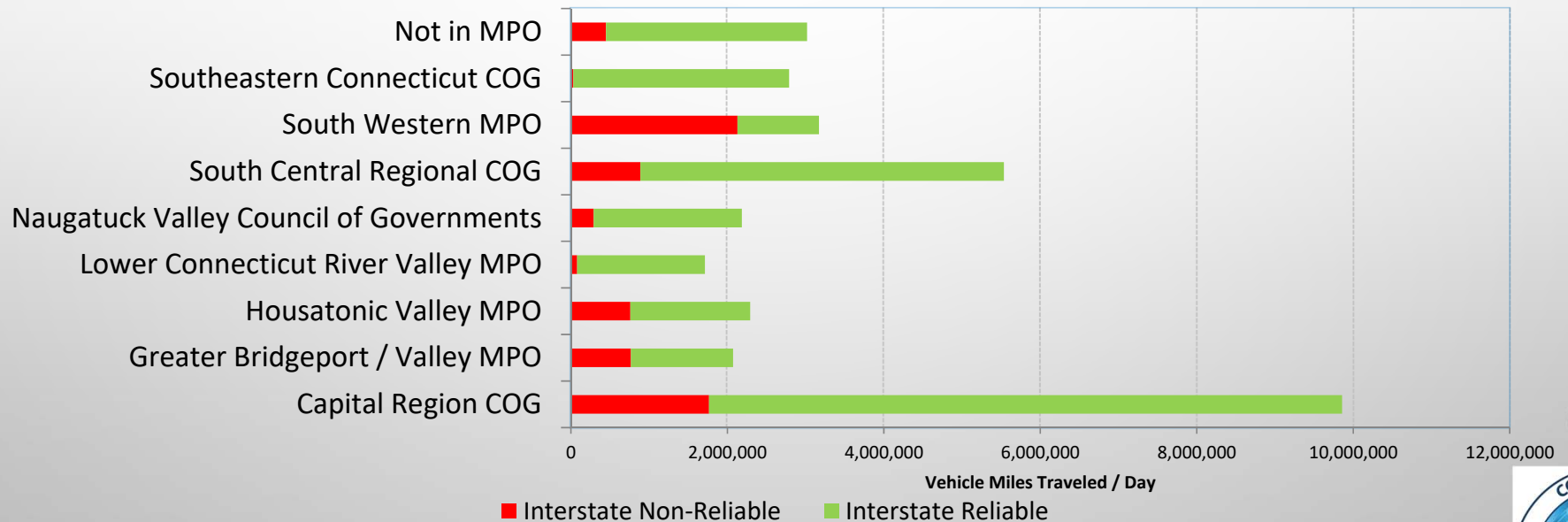
System Reliability Findings

Statewide Level of Travel Time Reliability
Based on Vehicle-Miles Traveled



System Reliability Findings

Level of Travel Time Reliability (Interstate System)
Based on Vehicle-Miles Traveled



System Reliability Findings

System Performance Measure (% Reliable), Interstate System
Based on Vehicle-Miles Traveled

Likely lowest
MPO Interstate
reliability in US

Southeastern Connecticut COG

South Western MPO

South Central Regional COG

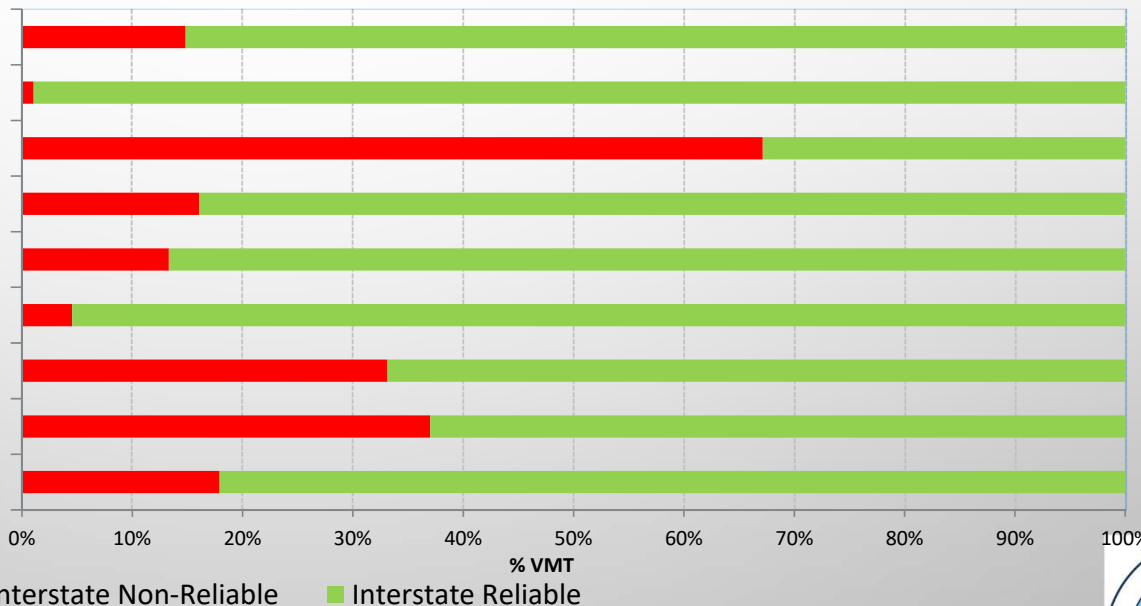
Naugatuck Valley Council of Governments

Lower Connecticut River Valley MPO

Housatonic Valley MPO

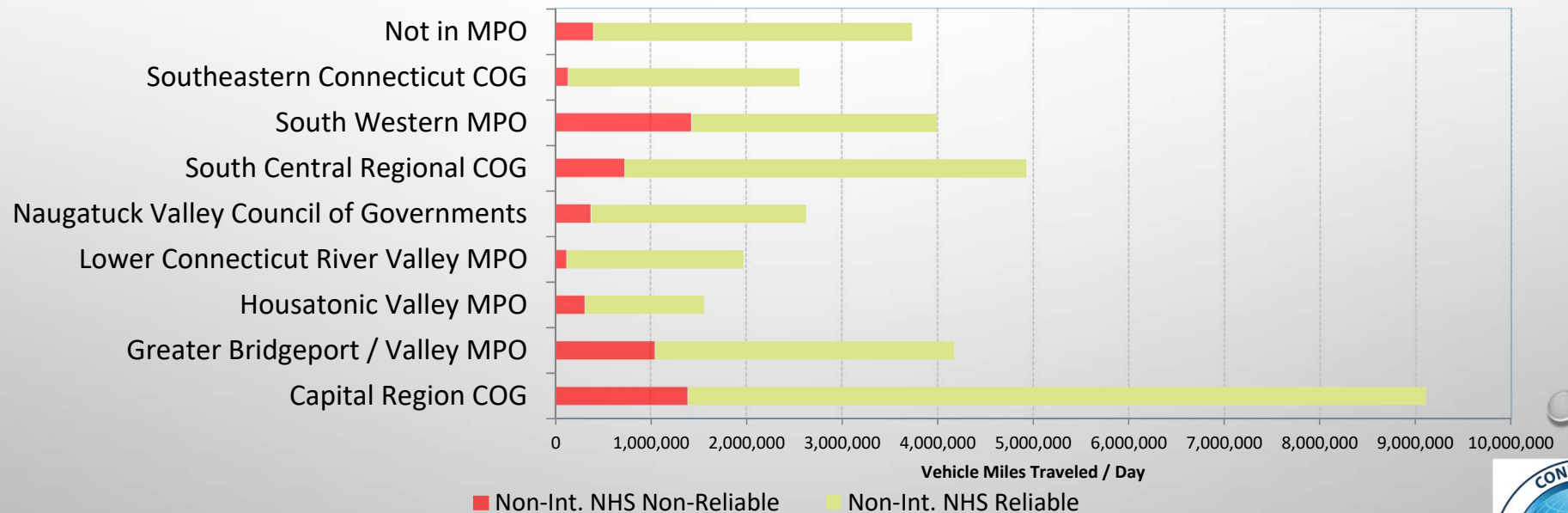
Greater Bridgeport / Valley MPO

Capital Region COG



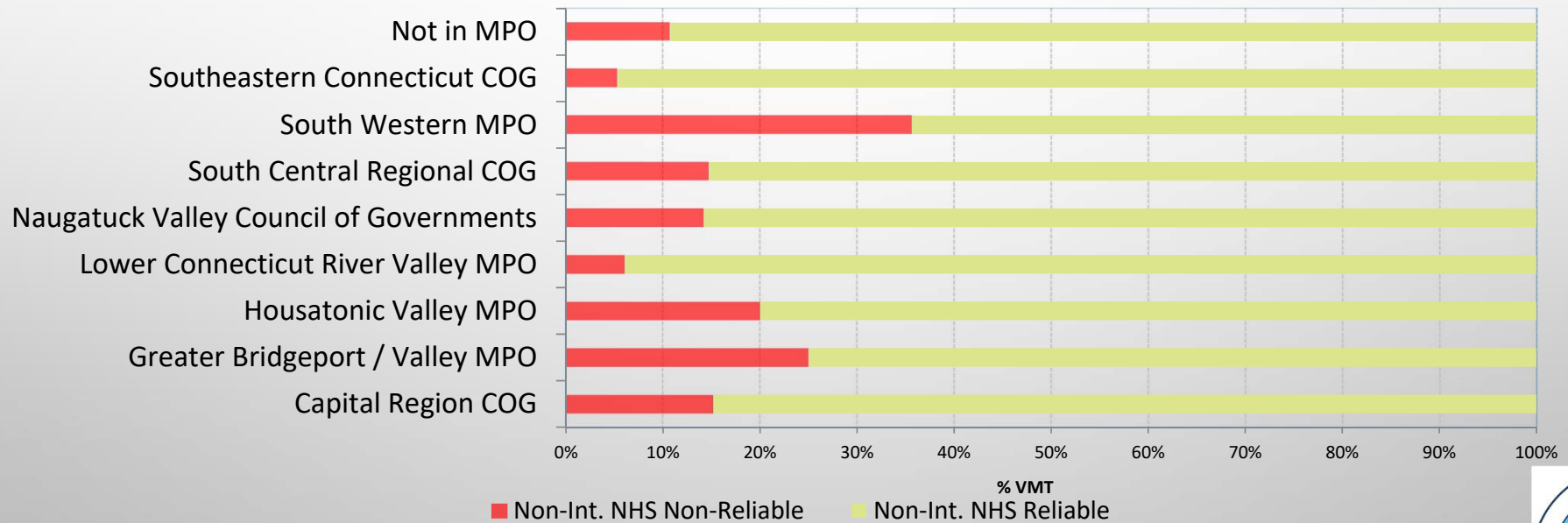
System Reliability Findings

Level of Travel Time Reliability (Non-Interstate NHS)
Based on Vehicle-Miles Traveled



System Reliability Findings

System Performance Measure (% Reliable), Non-Int. NHS
Based on Vehicle-Miles Traveled

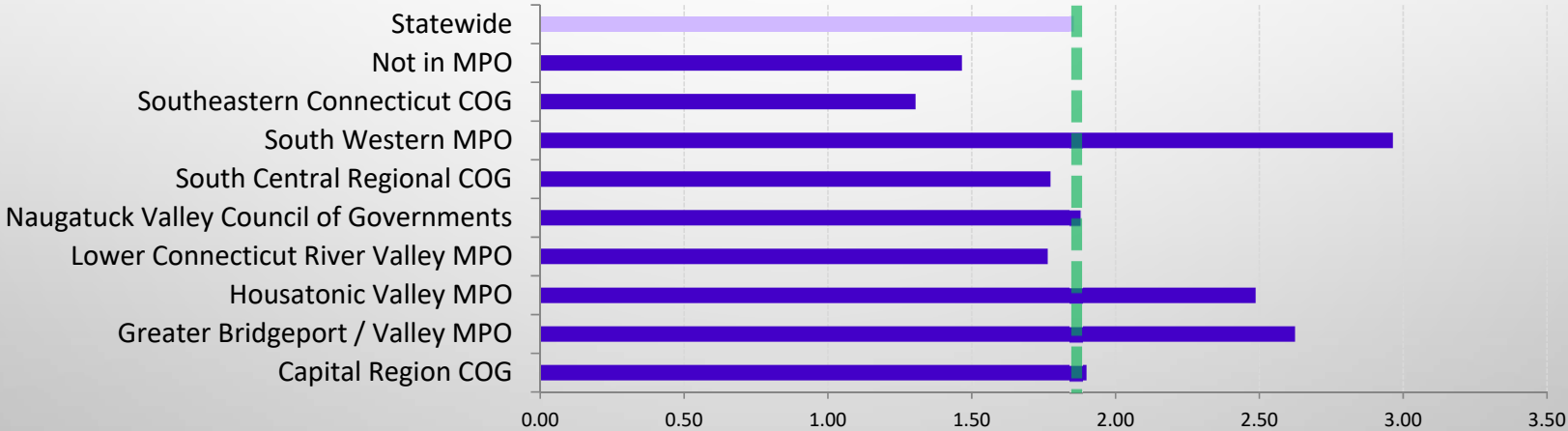


Freight Findings

Truck Travel Time Reliability

Weekday { 6-10AM, 10AM-4PM, 4-8PM }

Weekend { 6AM-8PM, 8PM-6AM }



Highest 95/50 percentile Travel Time Ratio of 5 time periods

