NCHRP 23-07: Effective Methods for Setting Transportation Performance Targets

TPM Webinar Series

Pavement. June 30, 2022

ICF

With support from

HIGH STREET

applied pavement TECHNOLOGY

Agenda

Welcome & Overview of Methods

Presentation by Vermont DOT + Q&A

Presentation by South Dakota DOT + Q&A

Discussion

Navigating Zoom

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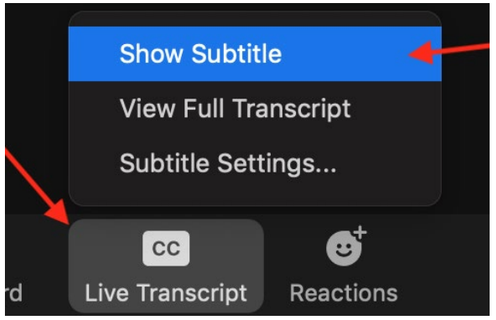
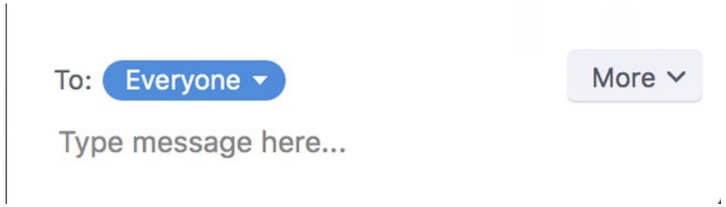
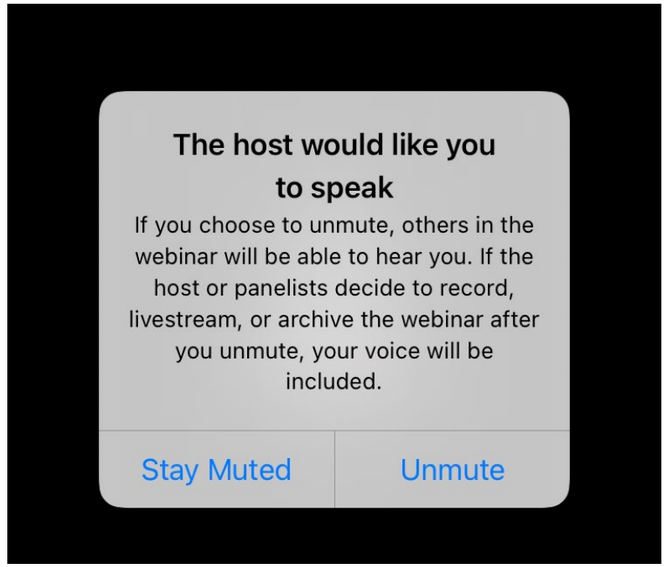


To ask a question, type the question in the chat or click “Raise Hand” to be called on.



If your hand is raised, we will give you the capability to unmute and ask a question.



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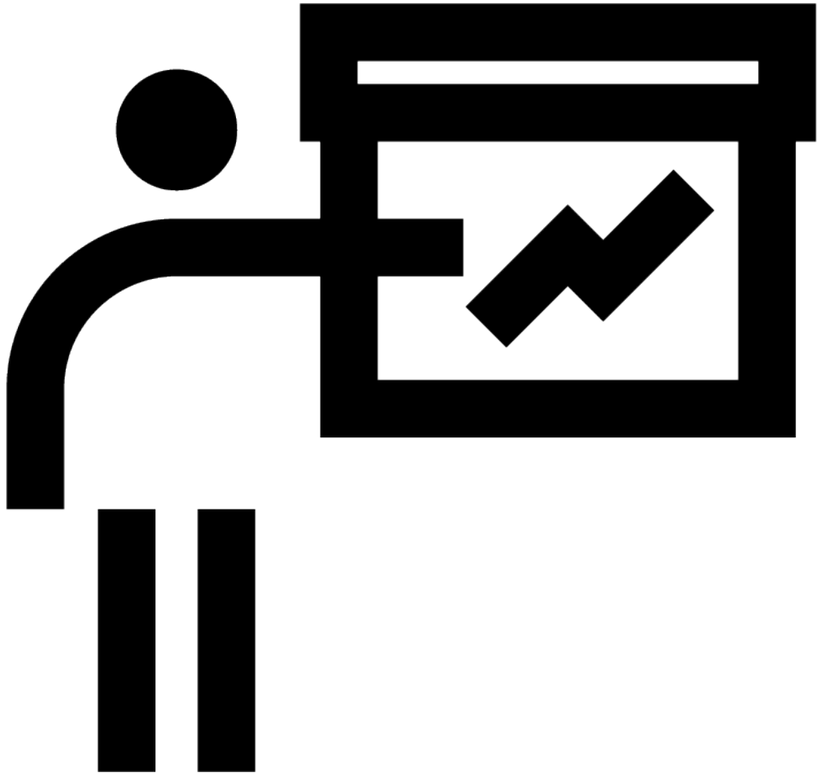
Guidebook Purpose

To help State DOTs and MPOs identify effective methods for setting transportation performance targets.

Guidebook Contents

- Part I. Target Setting Overview and Tips
  - Introduction to Guidebook
  - Target Setting Foundations
  - Practical Application Tips
- Part II. A Menu of Target Setting Methods
  - Target Setting Methods for Safety
  - Target Setting Methods for Infrastructure Condition
  - Target Setting Methods for Reliability
  - Target Setting Methods for Traffic Congestion
- Part III. Target Setting for Non-Required Measures
  - Why Use and Set Targets for Other Measures?
  - Examples of Performance Measures and Targets



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Types of Target Setting Methods Used

- Policy-Based
  - E.g., no more than 5% of pavement in *Poor* condition
- Historical Trends
  - E.g., based on trends over the past 5 years
- Probabilistic and Risk-Based Approaches
  - E.g., considering potential variability in performance
- Statistical Models that Account for Explanatory Factors
  - E.g., regression model
- Other Tools and Models
  - E.g., asset management management systems

Target Setting Philosophies

Conservative
Help ensure the agency can attain the target

Realistic/ Predictive
Level most likely to occur

Aspirational
Reflect commitment to improved outcomes

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Guidebook Part I: Target Setting Overview and Tips

What Makes a Target Setting Method Effective?

- **Ease of Application**
- **Technical Robustness**

→ Helps inform investments and strategies by providing information about factors driving performance

- **Ease of Communication**
- **Allows for Policy Consideration**

→ Motivates stakeholders and decision makers to engage in discussions about actions to meet targets

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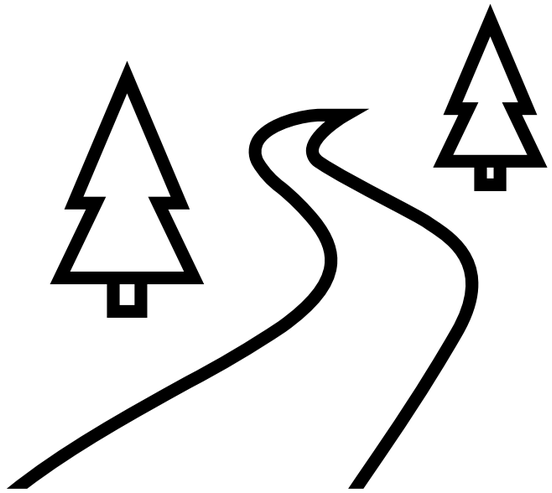
Pavement Performance Measures

- **Pavements**
  - The percentage of Interstate pavement in *Good* condition
  - The percentage of Interstate pavement in *Poor* condition
  - The percentage of non-Interstate NHS pavement in *Good* condition
  - The percentage of non-Interstate NHS pavement in *Poor* condition



Guidebook Part II: Target Setting Methods

Method	
Targeted Change	*Select to use the baseline figures or selected value*
Time-Series Trend	*Forecast based on historical performance trend*
Time-Series Trend Plus Future Funding	*Accounts for anticipated funding levels*
Model/System-Based	*Asset management system based (uses pavement or bridge management system)*
Scenario Analysis	*Uses an asset management system to predict conditions, but analyzes multiple funding levels or strategies for prioritizing funding*

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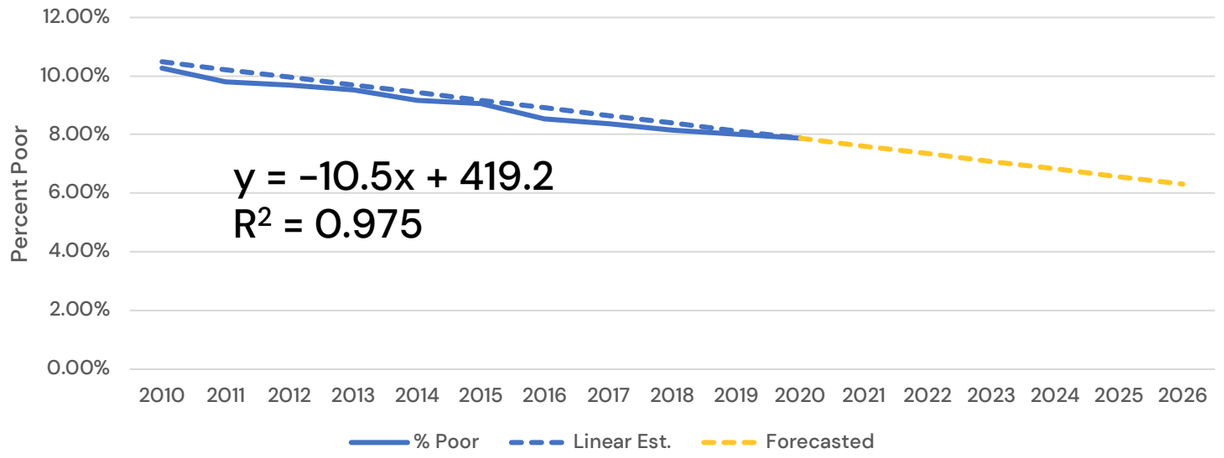
Targeted Change

Strengths	Limitations	Other Considerations
Simplest approach. Allows agencies to establish targets when data confidence is not sufficient to support other methods	No insights into causes of outcomes	-

Time-Series Trend

Strengths	Limitations	Other Considerations
Simple approach. Does not require special analysis tools	Quality historic data is needed to establish reasonable trends. Assumes investment decisions will remain consistent	-



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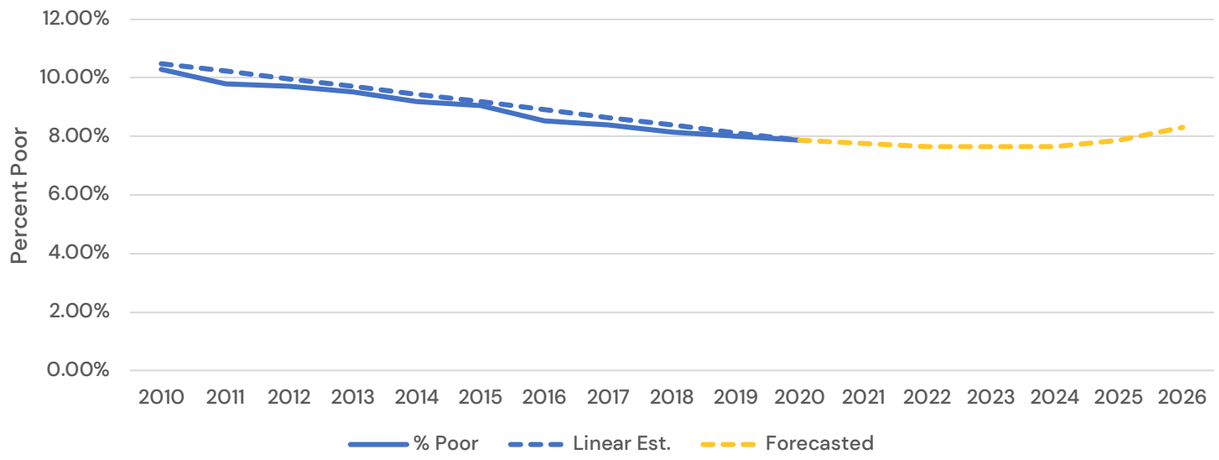
Time-Series Trend Plus Future Funding

Strengths	Limitations	Other Considerations
Still relatively simple. Accounts for changes in available funding or programming priorities	Quality historic data is needed to establish reasonable trends	-



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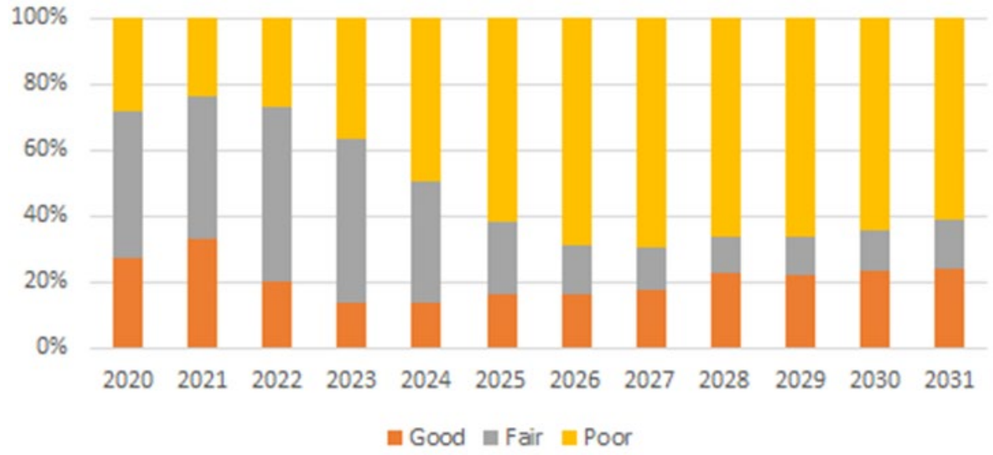
Model/System Based

Strengths	Limitations	Other Considerations
Forecasts asset conditions based on agency specific performance, costs, treatments, and priorities	Requires asset management systems to be configured and validated. Historic data is needed to establish accurate deterioration rates	Adjustments may need to be made to translate projected conditions from State measures to national performance measures. Not all NHS assets may be included in State databases



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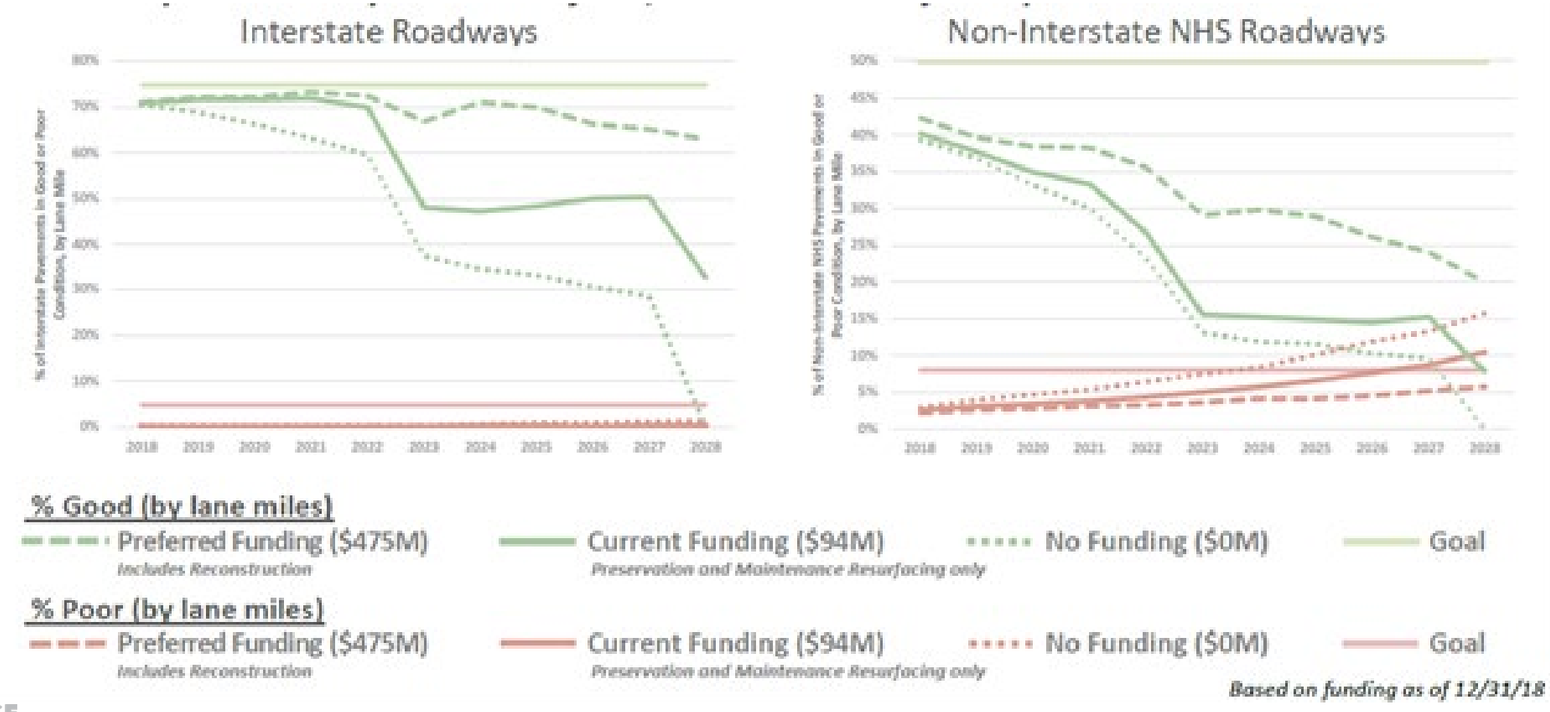
Scenario Analysis

Strengths	Limitations	Other Considerations
Provides decision makers with information on the expected outcomes from different investment strategies. Can support integrated establishment of targets and investment strategies	Requires accurate models and the ability to vary funding inputs. Internal business processes may not support integrated decision making between TPM and programming	-



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Presenters

- Reid Kiniry
  - Vermont Agency of Transportation

- Phil Clements
  - South Dakota DOT

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Setting Pavement Performance Targets

Reid Kiniry June 2022

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The Rule: 23 CFR 490.315

The percentage of lane miles of pavements on the Interstate System in Poor condition shall not exceed 5.0 percent.

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Performance Measures and Targets

What we had:

- Full distress already collected for entire State system
- Vermont Pavement Performance Measures
- Pavement Management System

What we needed:

- Cracking Definition
- Cracking Calculation
- Cracking Deterioration Model
- Target Setting
- Data Quality Management Plan

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Target Setting

- Looked at VT Cracking Index
- Looked at VT Composite Index
- Looked at PMS condition projections for various budgets
- Conservatively selected 4.9%
- Presently < 1%

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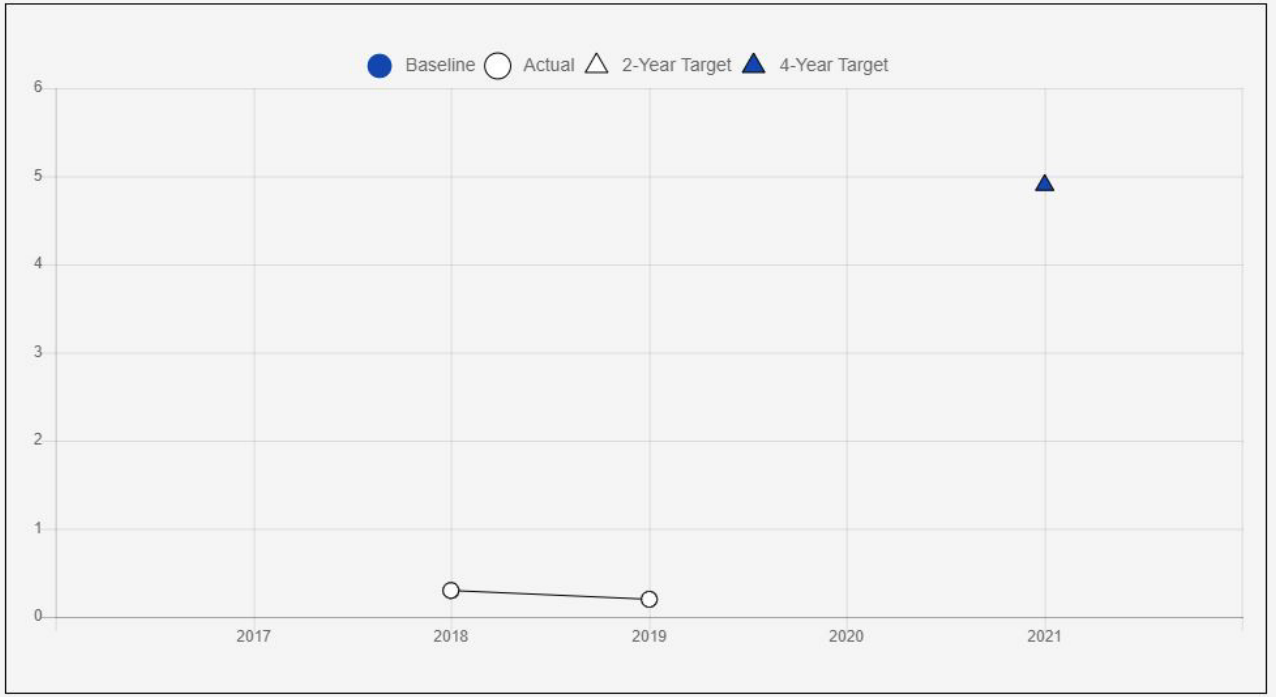
Interstate Pavement in Poor Condition

Trend through 2021

Desired trend: ↓



Vermont % Interstate Lane Miles in Poor Condition

Interstate Pavement in Poor Condition	2017	2018	2019	2020	2021
Condition/Performance	--	0.3	0.2	--	--
Target	--	--	--	--	4.9

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https://www.fhwa.dot.gov/tpm/reporting/state/condition.cfm?state=Vermont

Pavement Target Setting Methods for TPM – A SDDOT Experience

Phillip C. Clements, PE
Pavement Management Engineer, SDDOT

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

Overview

- Initial set of targets
- Initial target results
- Pavement Management Analysis
- Setting targets in the future
- Questions and discussion

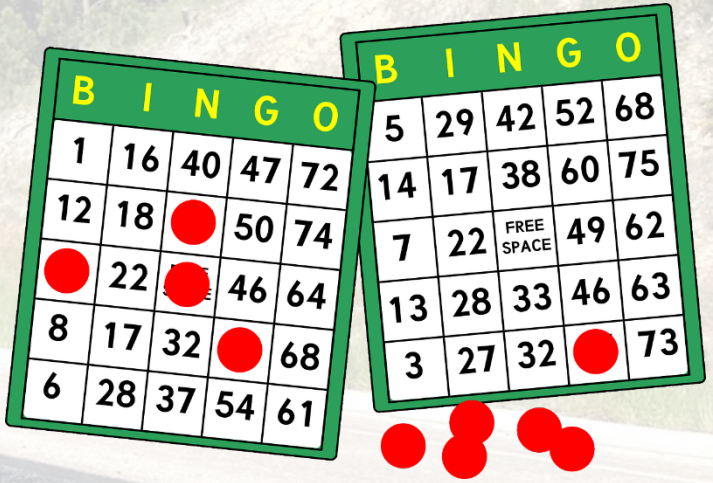
Target Setting Method

- Time-series trend?
- Target change?
- Hybrid of both

SCI = PM2 (?)

Slam Dunk

High Five



Bingo

SCI ≠ PM2

SCI = Mean – 1.25 x sd

where: Mean = mean of contributing indices

sd = The standard deviation of the indices

Four condition categories

Index	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12	Scenario 13	Scenario 14	Scenario 15	Scenario 16	Scenario 17	Scenario 18	Scenario 19	Scenario 20	Scenario 21	Scenario 22	Scenario 23	Scenario 24	Scenario 25	Scenario 26	Scenario 27
IRI	Good	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor
Cracking_Percent	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Poor	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Poor	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Poor
Rutting	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Overall	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Poor	Fair	Fair	Poor	Poor	Poor	Poor

Initial Interstate Analysis

According to lane miles			Federal Lane miles	SCI High	SCI Low	Percentage of lane mileage
		Good	1254.036	5	4.39	62.58707789
		Fair	715.22	4.38	0.65	35.69557002
		Poor	34.41	0.65	0	1.717352094
			2003.666			
				HPMS reporting does not take into account the CRCP issues with CRCP Block Cracking		

Interstate Analysis without CRC

Delete the CRC miles			Federal Lane miles	SCI High	SCI Low	Percentage of lane mileage	
		Good	981.266	5	4.41	68.21443418	
		Fair	422.826	4.41	2.66	29.39349407	
		Poor	34.41	2.66	0	2.392071752	
			1438.502				

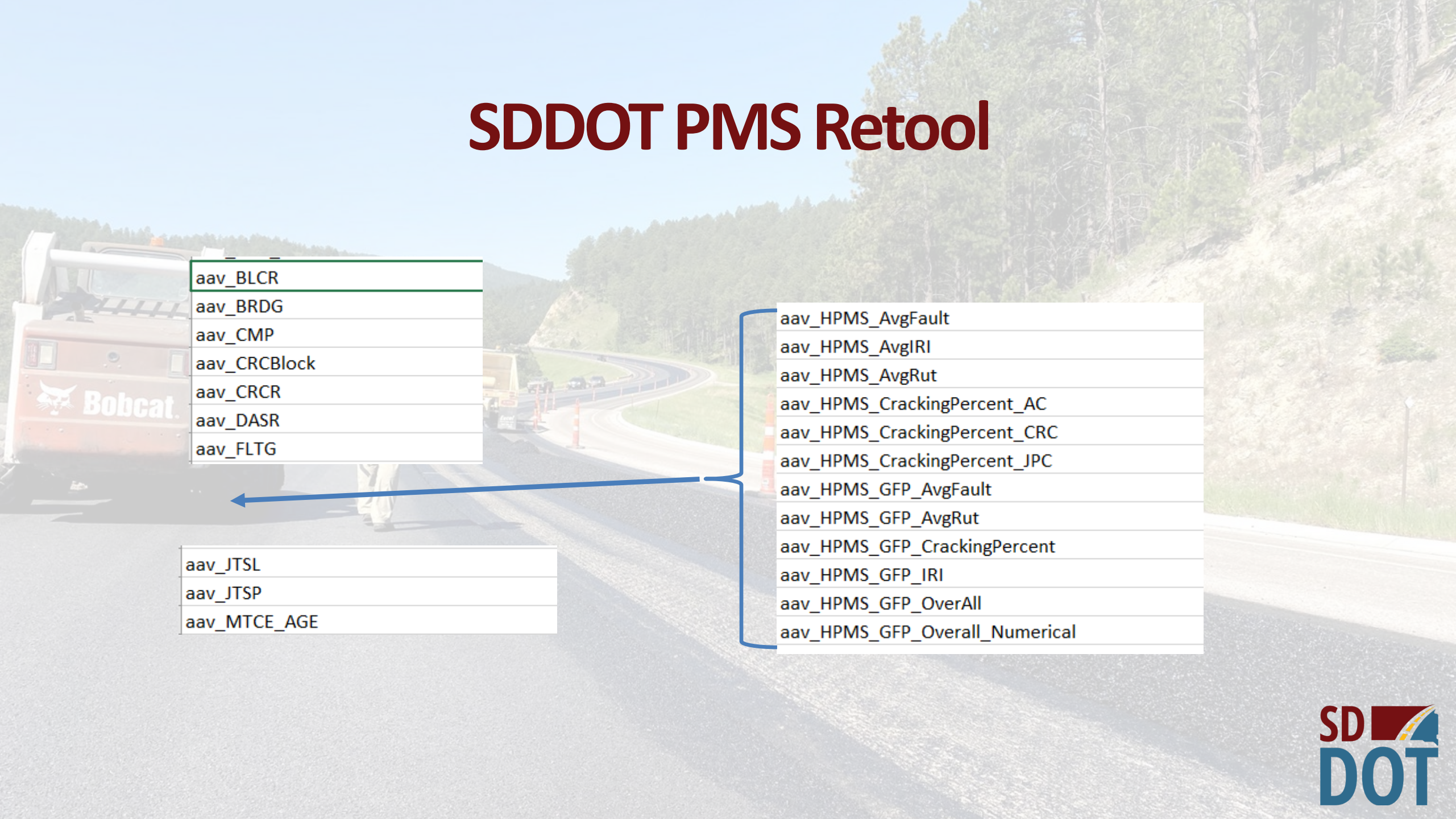
Highest poor percentage: 2.4 (this slide)

Lowest good percentage: 62.6 (previous slide)

Federal PM2 Targets and Conditions

Performance Measure	BaseLine	2-Year Condition/ Performance	2-Year	4-Year	4-Year Adjustment
Percentage of Pavements of the Interstate System in Good Condition		75.8%		62.6%	
Percentage of Pavements of the Interstate System in Poor Condition		0.0%		2.4%	
Percentage of Pavements of the Non-Interstate NHS in Good Condition	56.5%	60.5%			
Percentage of Pavements of the Non-Interstate NHS in Good Condition (Full Distress + IRI)		55.3%	41.5%	41.5%	
Percentage of Pavements of the Non-Interstate NHS in Poor Condition	6.4%	5.6%			
Percentage of Pavements of the Non-Interstate NHS in Poor Condition (Full Distress + IRI)		0.6%	1.5%	1.5%	

SDDOT PMS Retool



aav_BLCR
aav_BRDG
aav_CMP
aav_CRCBlock
aav_CRCR
aav_DASR
aav_FLTG

aav_JTSL
aav_JTSP
aav_MTCE_AGE

aav_HPMS_AvgFault
aav_HPMS_AvgIRI
aav_HPMS_AvgRut
aav_HPMS_CrackingPercent_AC
aav_HPMS_CrackingPercent_CRC
aav_HPMS_CrackingPercent_JPC
aav_HPMS_GFP_AvgFault
aav_HPMS_GFP_AvgRut
aav_HPMS_GFP_CrackingPercent
aav_HPMS_GFP_IRI
aav_HPMS_GFP_OverAll
aav_HPMS_GFP_Overall_Numerical

Convert HPMS Data

HPMS	SDDOT
IRI	**Roughness**
0 – 225(+)	5 – 0
Rutting	**Rutting**
0 – 0.6(+)	5 – 0
Faulting	**Faulting**
0 – 0.25(+)	5 - 0

Convert HPMS Data (Part 2)

HPMS	SDDOT
JCP Cracking %	**JCP Cracking %**
Held constant	Held constant
CRCP Cracking %	**CRCP Block Cracking**
0 – 20(+)	5 – 1.7(-)
AC Cracking	**Fatigue Cracking**
0 – 20(+)	5 – 2.2(-)

Parallel PMS Universe

No Treatment

JCP Cracking %

Held constant

All other indices

Deteriorate according to model

Treatment applied

JCP Cracking %

Reset

All other indices

Reset then Deteriorate according to model

If I Could Save Time in a Bottle

- Set-up about 120 hours (over two summers)
- Testing about 40 hours

Impact to PMS

- Variable are run as part of analysis process
- Time impact is negligible
- Ability to set targets using PMS
- Scenario analysis

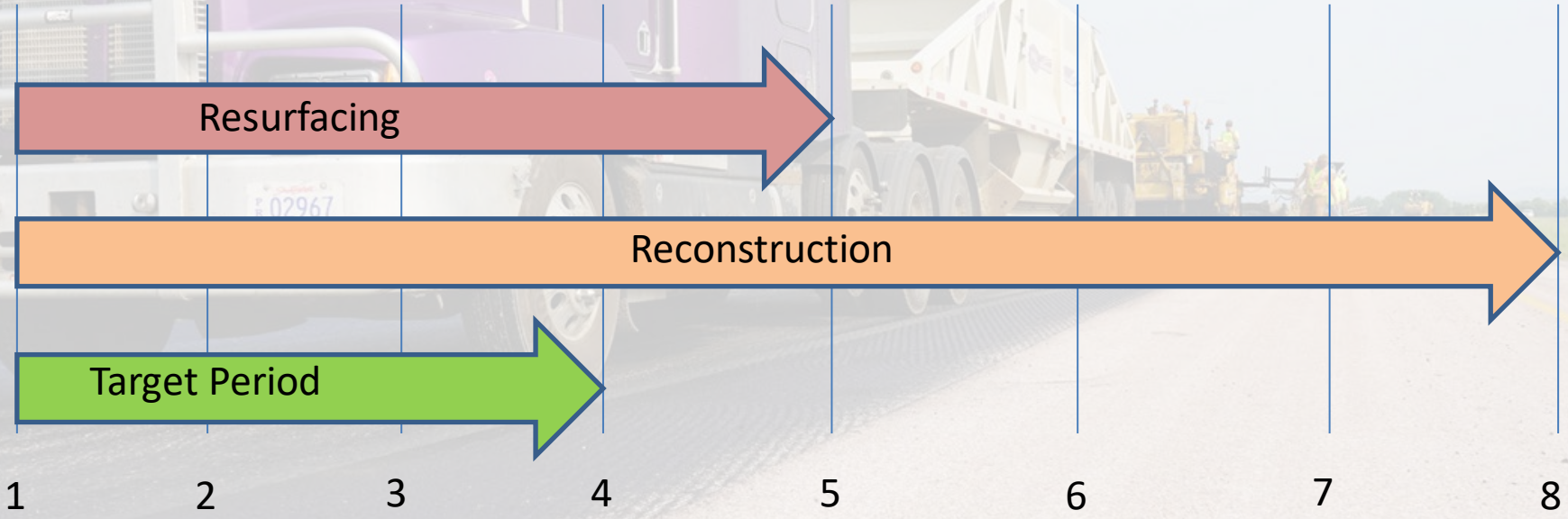
Internal SDOT Performance Measures

Funding Category	Minimum SCI	Goal SCI
Network	3.55	3.90
Interstate	3.80	4.20
Major Arterial	3.70	4.00
Minor Arterial	3.20	3.80
State Secondary	3.00	3.60
State Urban	3.60	4.10
State Municipal	3.55	3.90

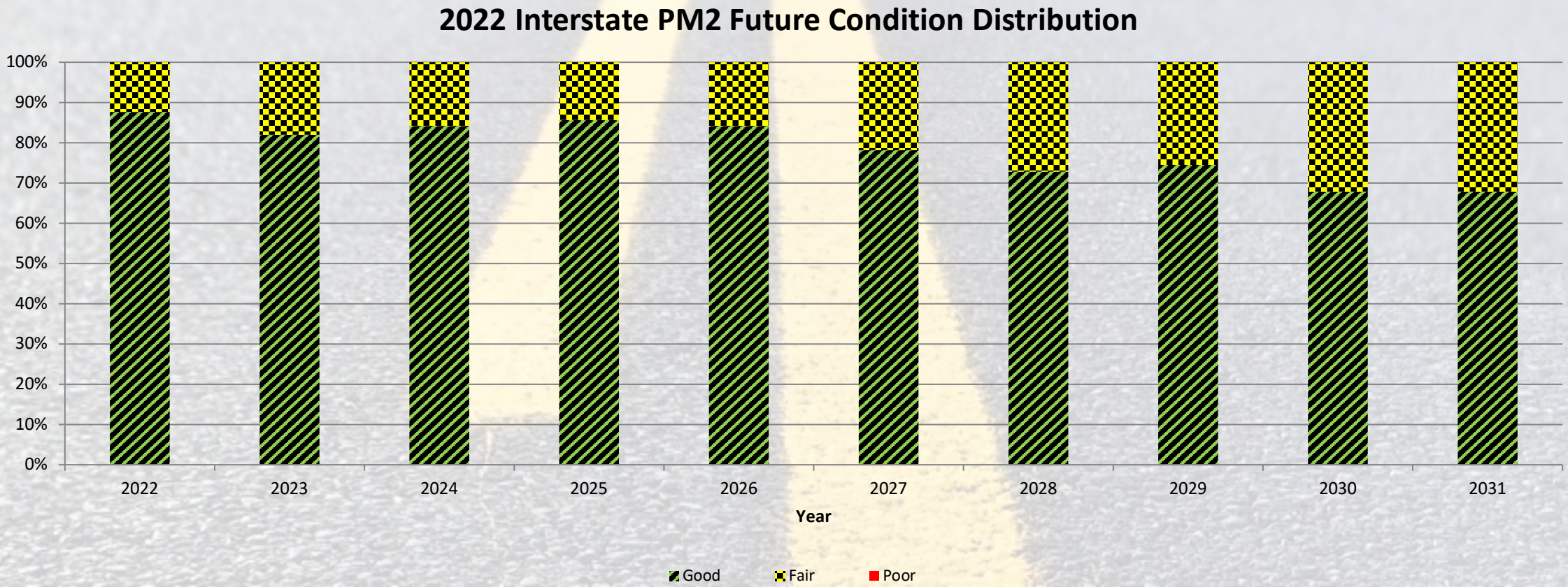
South Dakota Requirements

- South Dakota Codified Law 31-2-20.1
- Based on South Dakota Surface Condition Index (SCI)
- 10-year target period
  - Minimum 80% Excellent to Good
  - Evaluated and reported annually

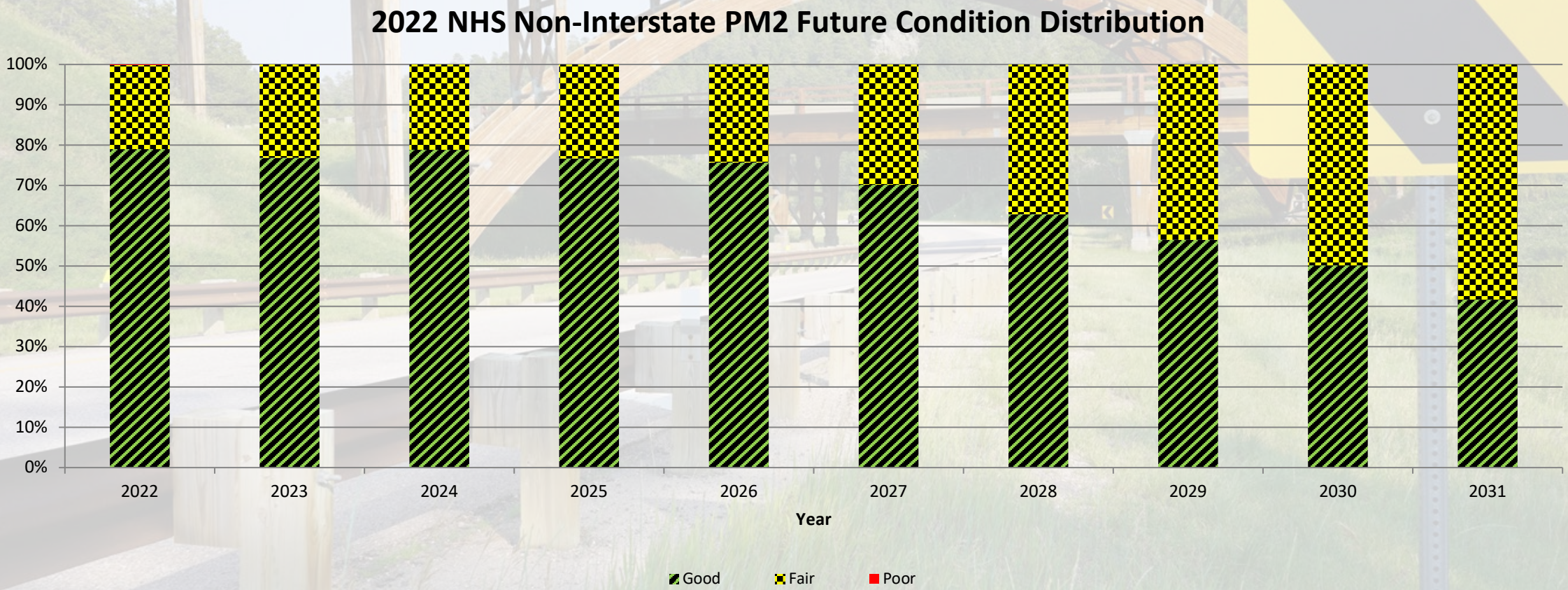
SDDOT STIP Timeline



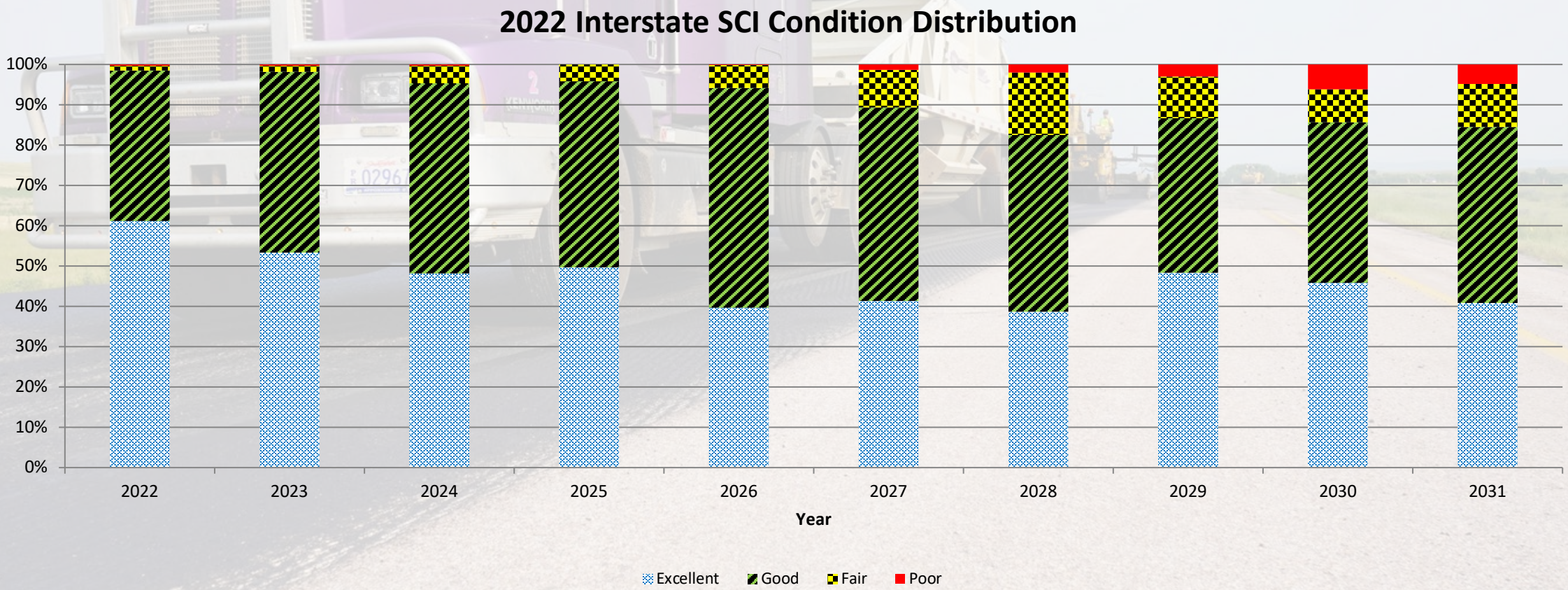
Interstate PM2 – 10 Year



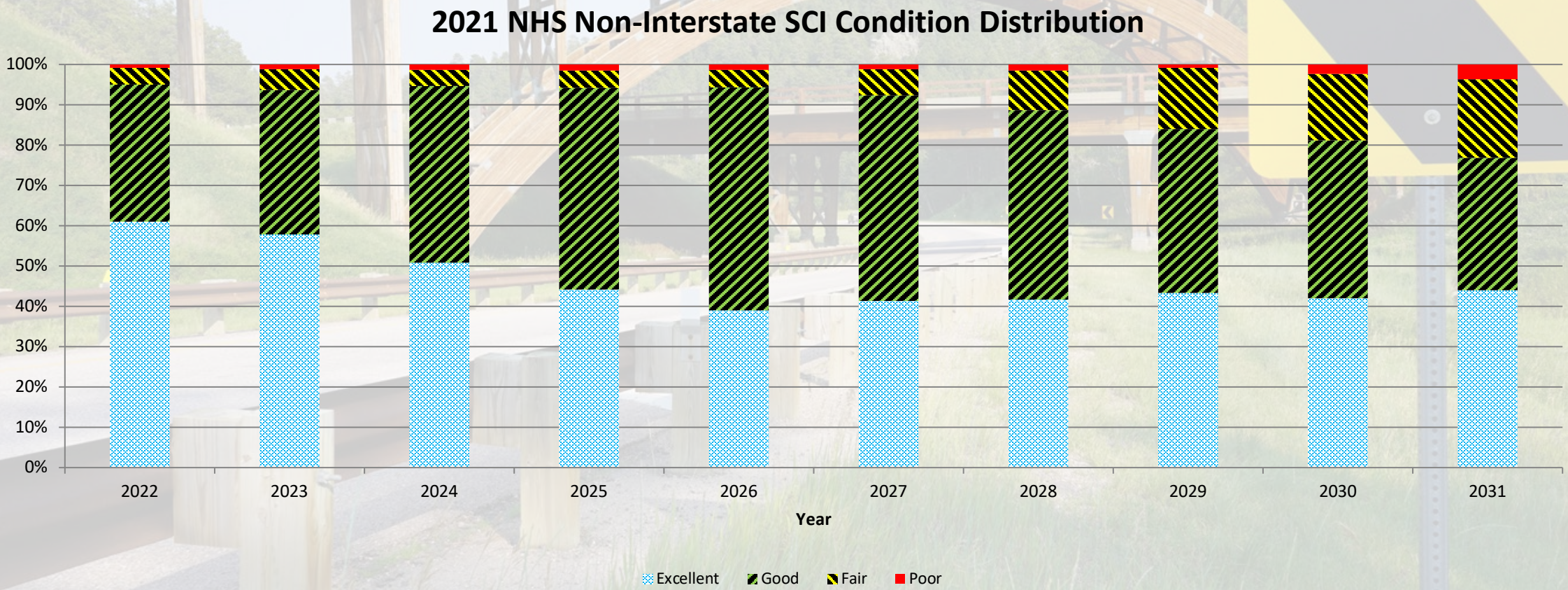
NHS Non-Interstate PM2 – 10 Year



Interstate SCI – 10 Year



NHS Non-Interstate SCI – 10 Year



Questions?

- **Ad hoc questions and discussions**

https://dot.sd.gov/projects-studies/planning/pavement-management

Discussion

- What challenges or benefits have you found with your method of target setting?
- Do you or your agency wish to use a different method but face a barrier?
- Have you been able to leverage the target setting or performance review process to bring about new actions to address performance?
- What elements have made the process more effective/ meaningful?
- Have agencies set increasing (worsening) targets and still missed them?
- How have you successfully communicated your targets to your MPOs? Leadership? The public?