AASHTOWare Pavement ME Design

Implementation Status and Issues

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applied pavement TECHNOLOGY
providing engineering solutions to improve pavement performance

Presentation Outline

- Recap Pavement ME Design (PMED) history
- FHWA/AASHTO National Pavement ME Users Group (MEUG) Meetings
- ME implementation progress
- ME implementation issues
- 4th Annual MEUG meeting

Recap Pavement ME Design History

- Design procedure
  - NCHRP 1-37A Final Report (2004)
  - AASHTO MEPDG Manual of Practice (MOP) Interim Edition (2008)
  - AASHTO Guide for Local Calibration (2010)
  - AASHTO MEPDG MOP 2nd Edition (2015)
  - AASHTO MEPDG MOP 3rd Edition (balloted in 2019)

Recap Pavement ME Design History (cont)

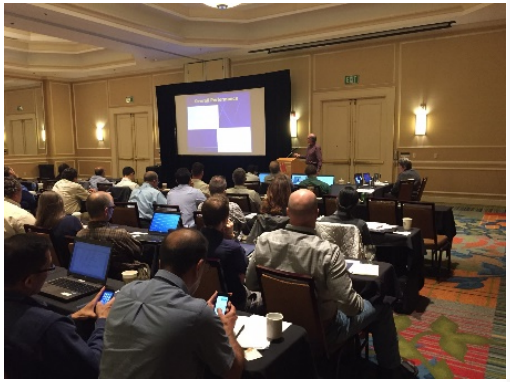
- Design software
  - MEPDG: v0.7 (2004) – v1.1 (2009)
  - AASHTOWare DARWin-ME: v1.0 (2010) – v2.0 (2012)
  - AASHTOWare Pavement ME Design (PMED): v1.3 – v2.5.5 (2013 – present)
  - Deflection Data Analysis and Backcalculation Tool (BcT): v1.0 (2017)

Recap Pavement ME Design History (cont)

- Training/Workshops
  - NHI courses
  - MEPDG User Group meetings (2008-09)
  - FHWA/AASHTO webinars (2012-present)
  - WisDOT / AASHTO R3 Peer Exchange (2013)
  - FHWA/AASHTO MEPDG Regional Peer Exchanges (2014-15)
  - **FHWA/AASHTO National Pavement MEUG meetings (2016-2019)**

National Pavement MEUG Meetings

- 2-Day Meeting Open to:
  - SHAs and Canadian PHAs (priority)
  - Industry groups
  - Academia
  - Consultants



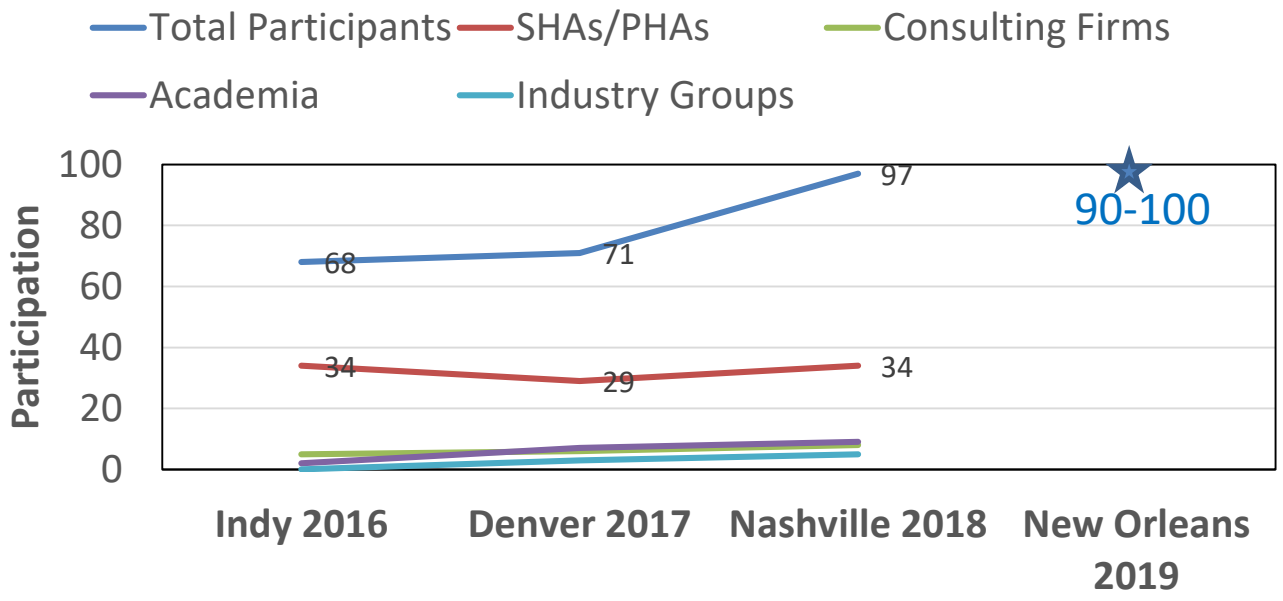
- Sponsored by FHWA (Tom Yu, Chris Wagner)
  - Planning, organizing, facilitating, reporting
- Supported by TPF-5(305), *Regional & National Implementation & Coordination of ME Design*
  - Invitational travel for Pooled Fund State reps

National Pavement MEUG Meetings

- Meeting objectives
  - Support SHA/PHA implementation of PMED procedures by providing a forum for:
    - sharing information.
    - identifying implementation issues at the local/regional level and organizing efforts to advance implementation
    - identifying needs or areas that still need to be researched relative to the MEPDG.

National Pavement MEUG Meetings (cont)

- Locations and Dates
  - Indianapolis, Dec 2016
  - Denver, Oct 2017
  - Nashville, Nov 2018
  - New Orleans, Nov 2019



National Pavement MEUG Meetings (cont)

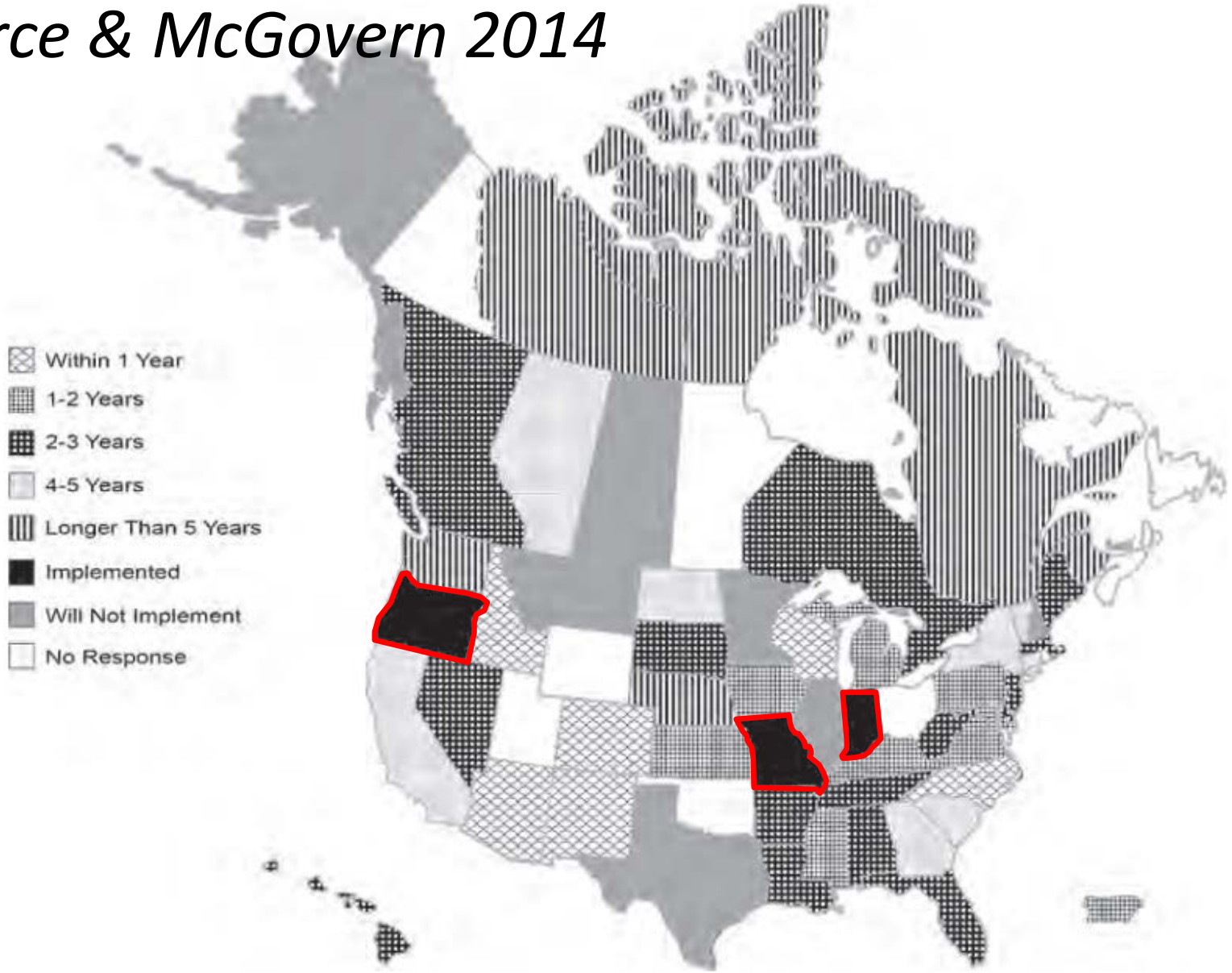
- Typical agenda
  - Agency briefings
  - PMED software updates/enhancements
  - Topic areas
    - Implementation experiences
    - HMA, PCC, and foundation design issues/applications
    - Performance criteria and reliability
    - Climate and traffic
    - Local calibration
  - PMED demo-based training
- Annual meeting reports: TPF-5(305) webpage

ME Implementation Progress

- Evaluation/testing → development → calibration → adoption/use
- Pavement types
- Tracking implementation
  - Early adopters: Missouri (2004), Indiana (2009)
  - NCHRP Synthesis 457 (2013)
  - FHWA/AASHTO MEPDG Regional Peer Exchange Meetings (2014-15)
  - FHWA/AASHTO National Pavement MEUG Meetings (2016-present)

NCHRP Synthesis 457 (2013 survey)

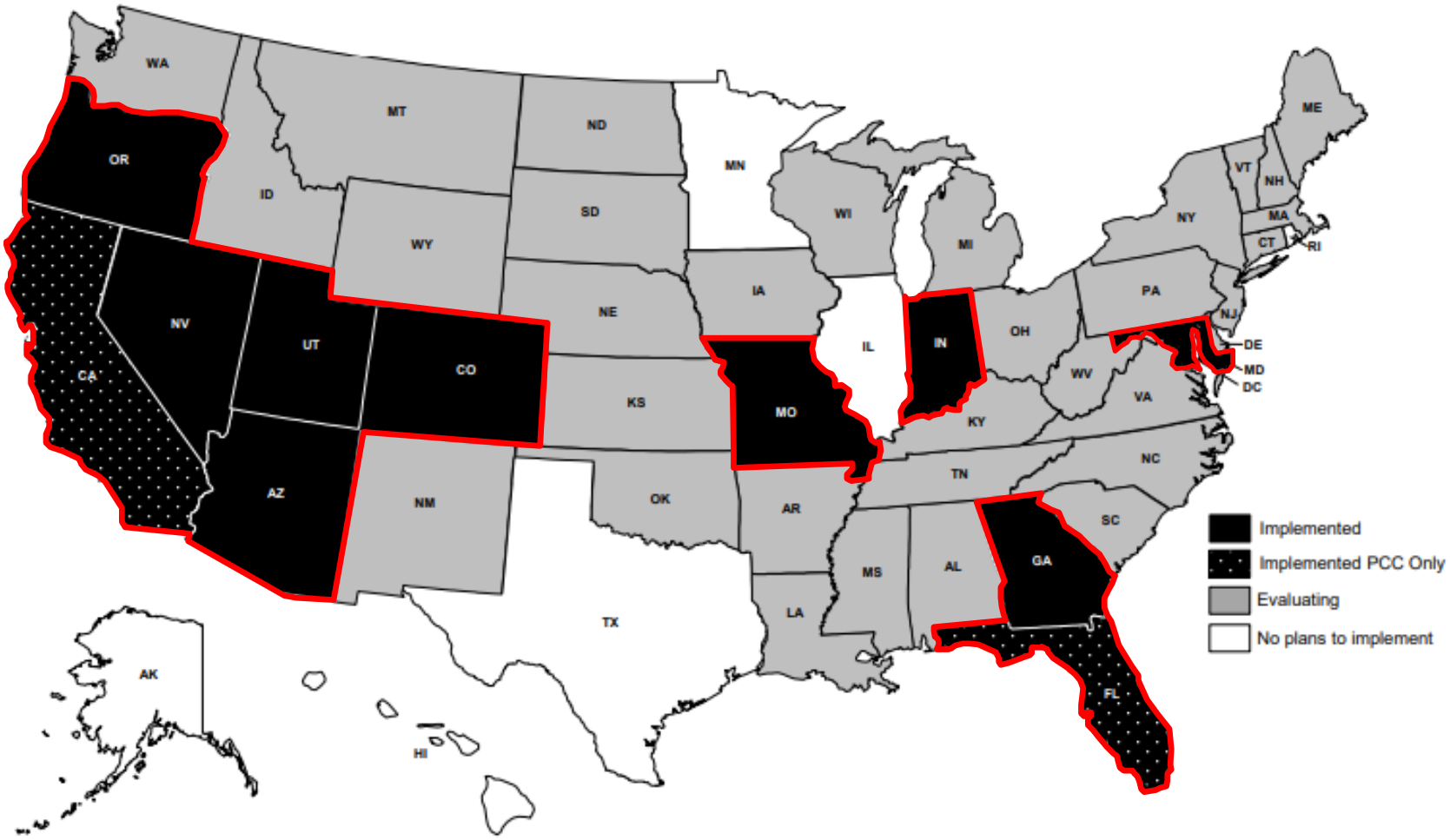
Pierce & McGovern 2014



Implementation in General

FHWA/AASHTO Regional Peer Exchanges (2014-15)

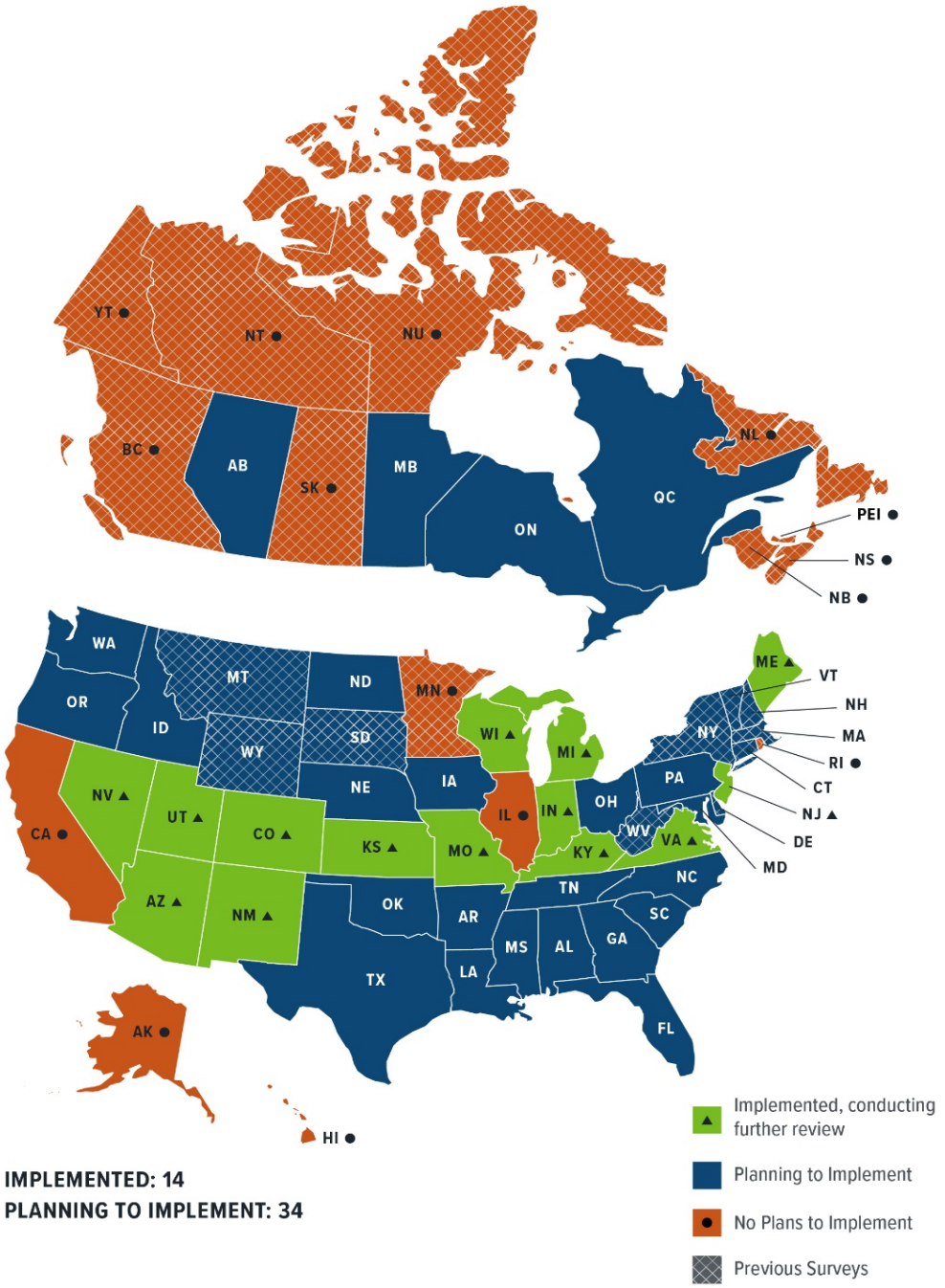
Pierce & Smith 2015



Implementation in General

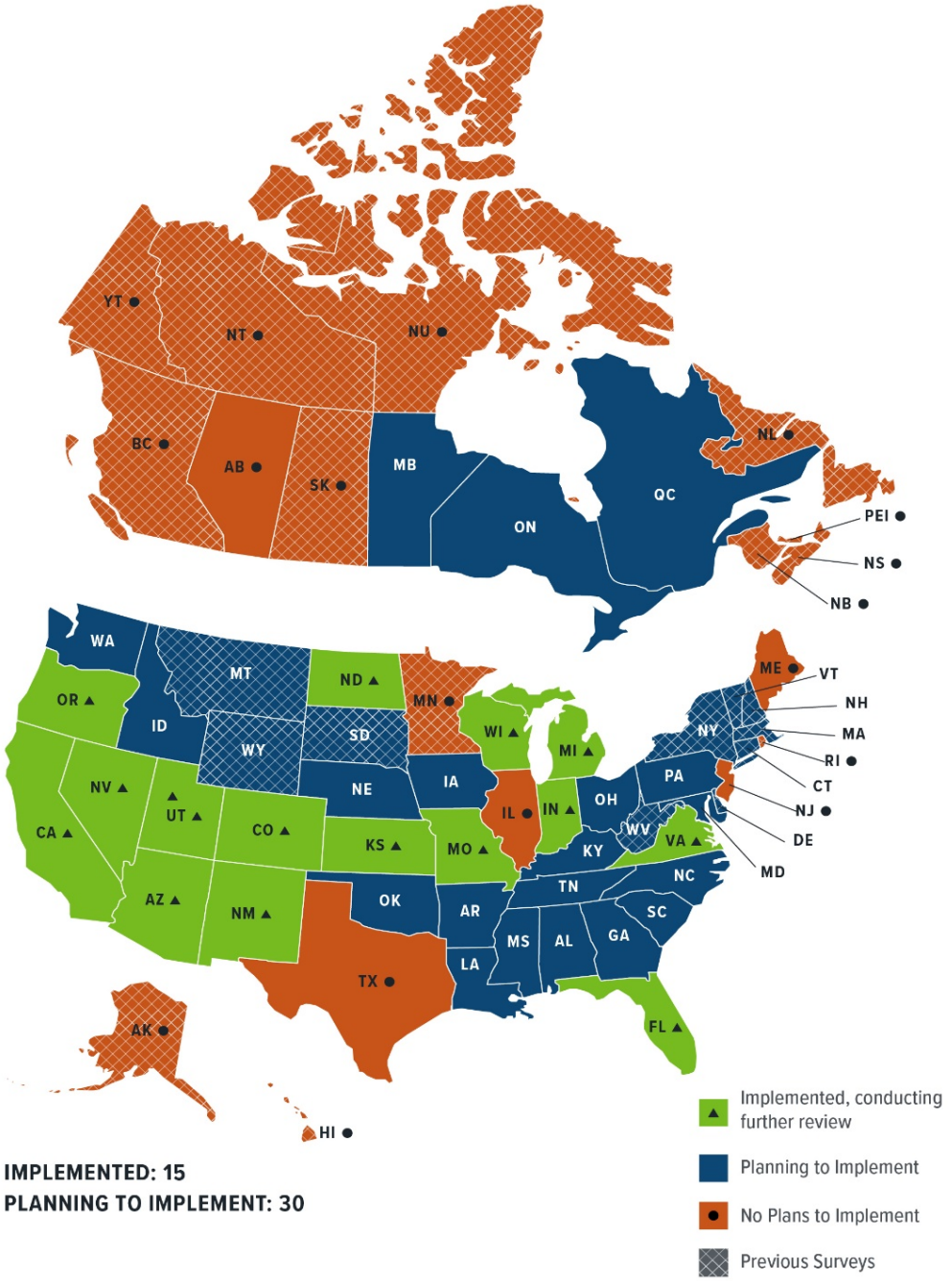
2018 MEUG Mtg
APTech/NCE 2019

Asphalt Pavements and/or Overlays



2018 MEUG Mtg
APTech/NCE 2019

Concrete Pavements and/or Overlays



ME Implementation Issues/Challenges

Key Issues/Challenges	2016 MEUG (Indy)	2017 MEUG (Denver)	2018 MEUG (Nashville)
Local calibration/validation of performance model coefficients	1 (12)	1 (10)	1 (13)
Availability of data to adequately characterize inputs (materials, traffic, etc.)	2 (8)		3 (6)
Availability of performance data to adequately perform local calibration/validation	3 (7)	3 (4)	
Designing pavement structures with features not included in PMED (e.g., geogrids, permeable treated bases, thin PCCOLs) and/or use of unconventional materials (CIR, FDR, WMA, R^2AMs)		2 (5)	2 (8)
Characterization of HMA material properties		3 (4)	

ME Implementation Issues/Challenges (cont)

- Local calibration/validation of performance model coefficients
  - Performance database expanded with more data collected → recalibrate
  - Calibration effort time-consuming, costly (especially when done multiple times)
  - Challenges with re-calibration amid changing software versions (new/updated distress models, climate models, etc.)
- "Calibrator" automated calibration tool
  - Webinar currently in-progress

4th Annual National Pavement MEUG Meeting

- New Orleans Crown Plaza-Airport
- Nov 6-7, 2019
- Of Interest:
  - ME research to practice (NCHRP 1-52, Calibrator)
  - FHWA *Pavement Design Best Practices Catalog*
  - AASHTOWare Pavement ME Task Force Q&A Forum
- E-Brochure
  - Agenda
  - Registration

Thank you!

NCHRP into PMED

Table 18. Timeline of NCHRP research projects related to MEPDG and the PMED software.

NCHRP Project	Title	Year Completed	Included in *PMED*
1-37A	Development of the 2002 Guide for the Design of New and Rehabilitated Pavement Structures: Phase II	2004	–
9-30	Experimental Plan for Calibration and Validation of HMA Performance Models for Mix and Structural Design	2004	No
1-39	Traffic Data Collection, Analysis, and Forecasting for Mechanistic Pavement Design	2004	Indirectly
1-40	Facilitating the Implementation of the Guide for the Design of New and Rehabilitated Pavement Structures	2006	No
1-40A	Independent Review of the Recommended Mechanistic-Empirical Design Guide and Software	2006	–
9-23A	Implementing a National Catalog of Subgrade Soil-Water Characteristic Curve (SWCC) Default Inputs for Use with the MEPDG	2007	No
1-42A	Models for Predicting Top-Down Cracking of Hot-Mix Asphalt Layers	2009	No (see 1-52)
1-40B	User Manual and Local Calibration Guide for the Mechanistic-Empirical Pavement Design Guide and Software	2009	–
1-40D(01)	Technical Assistance to NCHRP and NCHRP Project 1-40A: Versions 0.9 and 1.0 of the M-E Pavement Design Software	2009	–
1-41	Models for Predicting Reflection Cracking of Hot-Mix Asphalt Overlays	2010	Yes
1-40D(02)	Technical Assistance to NCHRP and NCHRP Project 1-40A: Versions 0.9 and 1.0 of the M-E Pavement Design Software	2011	–
1-47	Sensitivity Evaluation of MEPDG Performance Prediction	2011	No
9-23B	Integrating the National Database of Subgrade Soil-Water Characteristic Curves and Soil Index Properties With the MEPDG	2012	No
9-30A	Calibration of Rutting Models for HMA Structural and Mix Design	2012	Yes
4-36	Characterization of Cementitiously Stabilized Layers for Use in Pavement Design and Analysis	2013	FY 2017
1-48	Incorporating Pavement Preservation into the MEPDG	2013	FY 2018[1]
20-05, Topic 44-06	Implementation of the AASHTO Mechanistic-Empirical Pavement Design Guide and Software	2014	No
1-51	A Model for Incorporating Slab/Underlying Layer Interaction into the MEPDG Concrete Pavement Analysis Procedures	2016	FY 2018[2]
1-52	Top-Down Cracking Model for Asphalt Pavements	2017	FY 2018[2]
9-51	Material Properties of Cold In-Place Recycled and Full-Depth Reclamation Asphalt Concrete for Pavement Design	2017	Software addendum to be added
1-50	Quantifying the Influence of Geosynthetics on Pavement Performance	2017	FY 2018[2]
1-53	Improved Consideration of the Influence of Subgrade and Unbound Layers on Pavement Performance	2018	FY 2020 (plan)
1-59	Including the Effects of Shrink/Swell and Frost Heave in ME Pavement Design	2021	TBD
20-50(21)	Enhancements of Climatic Inputs and Related Models for Pavement ME Using LTPP Climate Tool (MERRA-2)	2021	TBD