Operations Task Force

Sunsetting Technologies

October 21, 2020
2:30-3:30 PM (Central)

Agenda

1. **Welcome**
2. **Project Highlight**
   - ENTERPRISE Pooled Fund Study – Evolving and Phasing Out Legacy ITS Devices and Systems
     - Presenter: Linda Preisen, Athey Creek
3. **Round Robin Discussion on Sunsetting Technologies from NWP Member States**
4. **Upcoming NWP Ops Task Force Webinars**
5. **Wrap Up**

Photo: courtesy MnDOT

Evolving and Phasing Out Legacy ITS Devices and Systems

ENTERPRISE

Linda Preisen, P.E.
Athey Creek Consultants

Athey Creek CONSULTANTS

North/West Passage Operations Task Force Webinar
October 21, 2020

ENTERPRISE

Evaluating New TEchnologies for Road PRogram Initiatives in Safety and Efficiency (ENTERPRISE)

- FHWA Pooled Fund Research Program
- ITS research, development, demonstration, standardization, deployment and evaluation

Members:

- Illinois DOT
- Iowa DOT
- Kansas DOT
- Michigan DOT
- Minnesota DOT
- Ontario (MTO)
- Pennsylvania DOT
- Texas DOT
- Wisconsin DOT

For more information: http://enterprise.prog.org/

Project Purpose

- Transportation agencies have deployed numerous ITS devices and systems
- Important to evaluate these “legacy” devices and systems
  - Have operational or end user needs changed?
  - Should the devices be replaced, reused, repurposed?
  - Discontinue operation? Evolve in some other way?

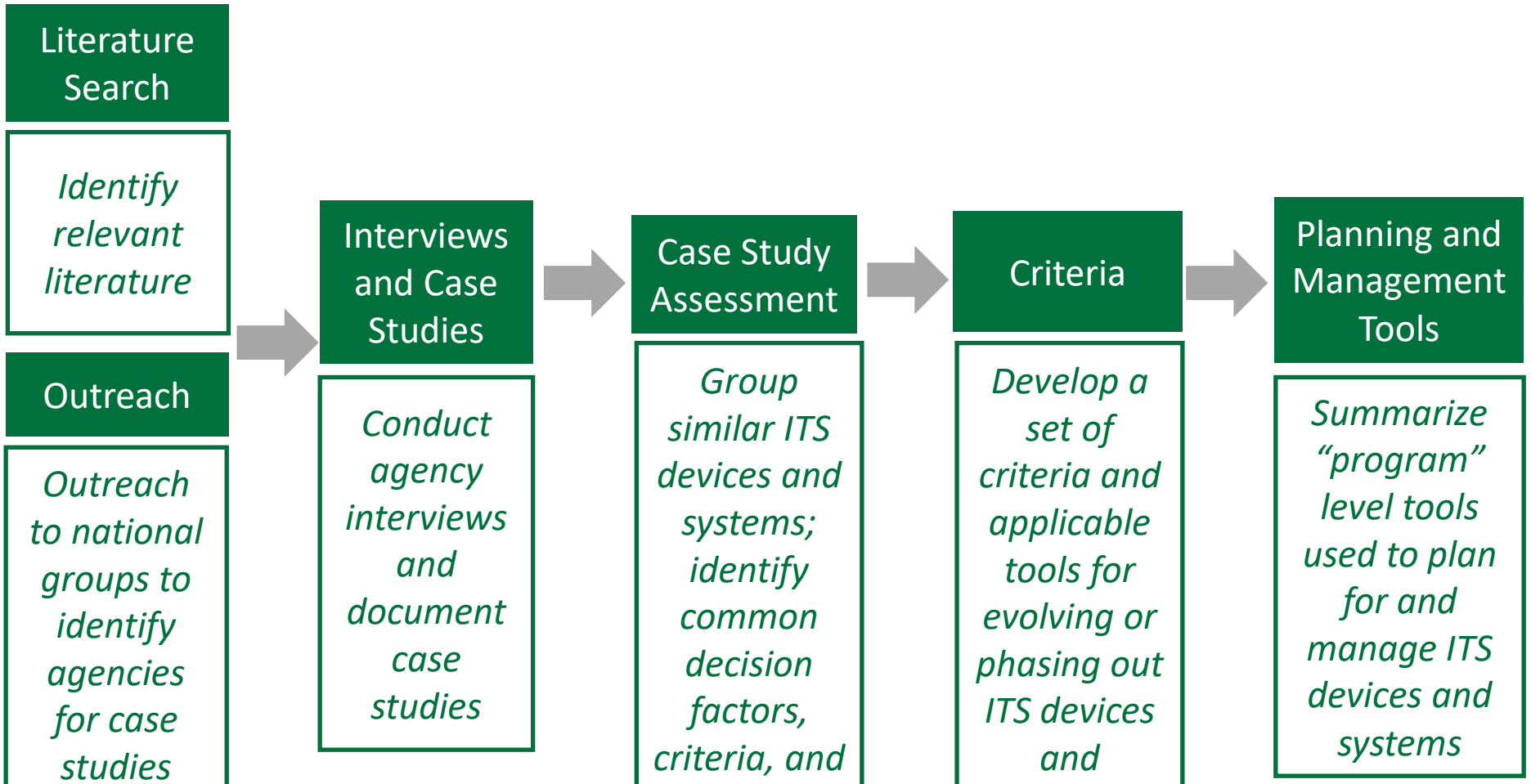
This project investigated decision factors, approaches, criteria and tools for evolving or phasing out ITS devices and systems

Example – Why Evolve or Phase Out?

Device / System	How Evolved or Phased Out?	Why?
Highway Advisory Radio →	Eliminated →	• Emergence of 511 websites and mobile apps; HAR coverage not statewide, newer vehicles don't have AM radio; safety • Some continued use of portable HAR units

Some agencies have retained HAR to serve travelers in rural or mountainous areas with limited cell coverage

Project Approach



Literature Search, Outreach, Interviews

16 Agencies Represented in the Case Studies:

- Alaska DOT&PF
- Caltrans
- Delaware DOT
- Illinois DOT
- Iowa DOT
- Kentucky Transp. Cabinet
- Maryland DOT State Hwy Administration
- Massachusetts DOT
- Michigan DOT
- Minnesota DOT
- Missouri DOT
- North Carolina DOT
- Ohio DOT
- Ontario Ministry of Transportation
- Pennsylvania DOT
- Wisconsin DOT

Nearly 60 case studies documented

Case Studies

How are agencies evolving or phasing out their ITS devices and systems? Why?

Case Studies

- Overview of Change
- Decision Factors
  - Why did your agency make this change?
- Feedback Received
  - What was the public response, if any?
- Tools
  - Used to inform decisions

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"Evolving and Phasing Out ITS Devices and Systems"

Case Study Summary - MnDOT

Agency	Minnesota Department of Transportation (MnDOT)
Information Source(s)	511 Citizen Reporting and 511 3G Website: • 1/9/19 email from Kelly Braunig, MnDOT • 1/15/19 interview with Kelly Braunig, MnDOT Intelligent Lane Control Signals (ILCS) in ATMS System: • 3/29/19 Interview with Brian Kary, MnDOT • *SMART LANES: Active Traffic Management* (August 2017) – provided by Brian Kary, MnDOT
ITS Devices or Systems in this Case Study Summary	1) 511 Citizen Reporting Feature (discontinued component) 2) 511 3G Website (discontinued component) 3) Intelligent Lane Control Signals (eliminated)

MnDOT Case Study #1: 511 Citizen Reporting Feature (discontinued component)	
Overview	MnDOT eliminated its 511 Citizen Reporting feature in July 2018. The citizen reporting feature allowed citizens to report road conditions via a web-based platform. These reports were then used to assist MnDOT convey road condition information on 511. The feature was initiated in November 2015; in use for approximately 2.5 years.
Decision Factors	• **Usage** – The number of citizen reporters who reported road conditions was very low. • **Cost vs. Benefits** - MnDOT reviewed the number of individuals reporting road conditions through the citizen reporting feature versus the maintenance/operational cost of the feature. The cost of the feature far outweighed the benefits from the few citizen reporters who used it. • **Improved Alternative** – At the time the citizen reporting feature was eliminated, MnDOT had made a decision to launch a Maintenance Decision Support System (MDSS)/Segments automated system which will provide much more frequent, accurate, and useful road condition information, compared to MnDOT's current reporting methods. The MDSS/Segments system, to be implemented in 2020, will provide road condition updates every 30 minutes, with more accurate and useful road condition data from numerous sources including Road Weather Information Stations (RWIS), National Weather Service, on-road data collected by plows, and Surface Weather Observation Stations (ASOS/AWAS).
Feedback	No feedback was received by MnDOT following this change.

Which Technologies are “Sunsetting”?

Current

Highway Advisory Radio

Many states have eliminated HAR. Some states retaining it.

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Legacy ATMS Software	Major upgrades and complete replacements.

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Future/Trends

Communications Infrastructure	Dial up modems to cellular. 3G to 4G. T1 lines to ethernet or fiber. Transition to FirstNet cellular. 5G? DSRC?

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Dynamic Message Signs	Replaced with in-vehicle messages?

Case Studies - Groupings

ITS Devices and Systems that Interface with Motorists as Primary Use	ITS Devices and Systems Primarily Used for Transportation Operations
• Highway Advisory Radio • Traveler Information Phone Service • Traveler Information Websites and Mobile Apps • Signs and Traffic Control Devices	• Traffic Detection • Monitoring Devices • Traffic Cameras • TMC Facilities and Operator Support • ITS Communications Systems • Agency-owned Devices vs. Service-based Solutions

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Signs and Traffic Control Devices

Signs and Traffic Control Devices

Signs and Traffic Control Devices	
Type of Change	Number of Case Studies
Limited or decreased deployment of DMS.	4 (AKDOT&PF Central Region, Iowa DOT, ODOT, WisDOT)
Evolving from mono-chromatic to full-color DMS	1 (PennDOT)
Eliminating or evolving various advisory signs and traffic control devices (e.g. intelligent lane control signals, intersection conflict warning systems, remotely operated interstate gates)	3 (MnDOT, Iowa DOT, Iowa DOT)

Signs and Traffic Control Devices

DMS Usage:

- Trend toward limited or decreased DMS deployments
  - Often with re-use or re-location to higher priority sites
- Driven by: Changing operational needs, understanding of actual usage of DMS for traffic messages, motorist feedback, and future CAV in-vehicle messaging

Iowa DOT DMS Decision Matrix

Scoring Criteria

						Justification Categories						Volumes	Crashes	DMS Usage		
						2	3	4	5	Sum	Category Score	AADT Score	Crash Score	Usage Score	TMC Input	Overall Score
ID	TS ID	Route	Direction	MM	Location	8	6	2	5		20%	20%	20%	20%	20%	100%
1	2	I-35	SB	88.4	Corp Woods	1	1	1	1	21	10	9	10	10	10	97
Prop 19		I-35/80	NB	125.43	US 6	1	1	1	1	21	10	10	8		10	95
212													9	9	9	94
Prop 59													8		10	93
655													9	10	10	93
23													10	10	10	92
658													10	10	10	92
4													7	10	10	90
24													9	9	9	88
Prop 60													8		8	88
125													10	10	10	87
45													9	9	9	86
25													9	10	10	84
76													10	10	10	84
657													10	8	7	82
Prop 18													9		10	81
26													7	8	8	80
211													4	10	10	80
69													10	7	7	79
3													4	10	10	77
Prop 13													9		5	77
403													10	10	2	76
302													8	9	9	76
Prop 10													9		5	75
653													7	4	8	72
63													8	5	8	72
218													8	4	4	72
22	32	I-235	EB	6.15	31st St		1	1	1	13	6	6	8	8	8	72
Prop 20		I-35/80	EB	130.34	I72nd Street	1	1	1	1	21	10	8	1		10	71
656	299	I-235	EB	11.7	Guthrie											

- **Justification Categories (location type)**
  - ✓ Major interchanges
  - ✓ Metro entrances and exits or state entrance points
  - ✓ Routinely congested corridors
  - ✓ Key locations for special events or incident management
- **Volumes**
- **Crash History**
- **DMS Usage**
- **TMC Operator Input**

Signs and Traffic Control Devices	
High-Level Decision Factors	Detailed Criteria and Applicable Tools
Operational Need/Benefit	• Traffic volumes in vicinity of DMS • Input from traffic operators – usefulness and critical locations • Research on effectiveness in terms of impact on operations (e.g. congestion)
Alternative(s)	• Portable DMS – select locations • Emergence of in-vehicle messaging
Cost vs. Benefits	• Considers capital, operations, maintenance costs – Cost vs. effectiveness (crash reduction and mobility benefits) – No significant cost increase for full-color DMS, with additional benefits – Updates to supporting systems, such as ATMS functionality
Usage	• Usage history (frequency, type of messages posted) for DMS locations
Maintenance	• Premature equipment failures • Obtaining components with limited vendors • Time to troubleshoot and repair devices
Aging Devices/ Antiquated	• Stage in equipment life cycle • Reuse of components to extend life of other devices • Potential for DMS to become obsolete, with increase in connected vehicles
Motorist Feedback	• Public input noting blank DMS / lack of usage
Safety	• Crash history downstream of DMS placement • Research on effectiveness in terms of crash reduction
Improved Information to Motorists	• Accuracy/timeliness of messages - improved with fewer DMS to manage • Human factors research – *Evaluation of Colored VMS Boards* PennDOT research report
Combined Factors	• Iowa DOT DMS Placement Criteria / Scoring Matrix - *Iowa DOT Intelligent Transportation Systems (ITS) and Communications Systems Service Layer Plan*

The Flip Side

March 2019

Governor Cuomo Announces Additional Electronic Message Signs and Traffic Cameras Along New York State Highways to Enhance Safety for Motorists

"…Department of Transportation installed and activated an additional 125 cameras and 143 Variable Message Signs (VMS) units at critical locations along major traffic corridors."

Source: www.governor.ny.gov/news/governor-cuomo-announces-additional-electronic-message-signs-and-traffic-cameras-along-new-york (Retrieved 12/2/19)

Traffic Detection

Traffic Detection

Traffic Detection	
Type of Change	Number of Case Studies
Using or considering third-party vehicle probe data to replace some or all field detectors	5 (ODOT, MassDOT, PennDOT, MoDOT, Caltrans)
Replacing pavement intrusive devices (e.g. loop detectors) with non-intrusive devices such as radar, Bluetooth, or microwave	3 (ODOT, MassDOT, MTO)
Use of updated Bluetooth technology, to enable real-time data collection	1 (DelDOT)

Traffic Detection

- Trend toward eliminating in-pavement field detectors for real-time operations
  - Difficult to maintain, disruption to operations
- Growing confidence in accuracy of probe data
  - Increased coverage compared to physical detectors
- Some physical detectors retained, for reporting to FHWA

Traffic Detection	
High-Level Decision Factors	Detailed Criteria and Applicable Tools
Performance	• % up-time of field detectors • Performance management tools (e.g. Caltrans Performance Measurement System (PeMS)- http://pems.dot.ca.gov/) to track operational status (% up-time) of field detectors • Impacts to operations when field detectors are displaced • Improved capabilities – real-time data collection or use for multiple purposes (e.g. video analytics software for use of cameras for monitoring and traffic data collection) • Increased coverage (e.g. probe data available in rural areas where field devices not deployed)
Maintenance	• Resources required to maintain or replace detectors displaced by roadwork or weather operations/snowplows • Safety impacts, considering traffic control during maintenance of field detectors
Cost	• Cost comparisons: – Traditional devices vs. probe data – Intrusive devices vs. non-intrusive devices • Includes costs for equipment, infrastructure such as communications, maintenance, and operations • Considers life-cycle costs, resources to maintain/replace devices to maintain sufficient operations
Accuracy	• Validation that lower-cost options are sufficiently accurate • Eastern Transportation Coalition Vehicle Probe Project - data validation findings https://tetcoalition.org/projects/vpp-marketplace/
Operational Needs/Usage	• Review of data needs and uses – e.g. travel times, traffic systems algorithms, reporting to FHWA
Alternatives	• Assessment of available alternatives (e.g. intrusive devices, non-intrusive devices, probe data)

Case Studies

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Planning and Management Tools & Approaches

What tools and approaches are used to guide decision-making, at a program level?

Strategic Technology Obsolescence Planning

PennDOT - Antiquated ITS Devices Framework

REPAIR	A device will be repaired when parts fail, and the maintenance contractor can easily provide those parts at a reasonable cost. As a "rule of thumb," after a component for a device is repaired three times, consideration should be given to retiring the component, or evaluating if the device itself can be efficiently repaired in the future. At this time, begin to compare the repair B/C to that of the other options listed.
REFURBISH	A refurbished device will keep the same skeleton/housing and structure, but have the "guts" removed, and replaced with parts that bring the device into compliance with today's standards. A refurbished device should also be accompanied with a new warranty. When considering the cost of refurbishing a device, compare the refurbish B/C to the replacement B/C to determine if a device should actually be replaced.
REPLACE	A device should be replaced when it is determined that it can no longer be repaired effectively, when parts are no longer available, or the supporting structure needs to be replaced. A device should also be replaced if the replacement B/C is greater than that of refurbishment. When a device has reached its end-of-life, and before it is replaced, consider if the need for the device still exists, or whether operations would benefit from relocating the device.
RELOCATE	A device should be considered for relocation when the current location no longer provides the maximum amount of coverage, the current location no longer meets standards, or other newer devices in the area / along the corridor provide more information to the motorists or the TMC. After determining a device should be relocated, consider if the existing device/structure can be utilized, or if it should be refurbished or replaced. This option should strongly be considered when planned or active construction projects are nearby.
REMOVE	The device should be removed when it is no longer needed to advise motorists of an event, or in the case of equipment such as vehicle detectors, may no longer provide meaningful information to the TMC. As with relocation, this option should strongly be considered when planned or active construction projects are nearby.

Strategic Technology Obsolescence Planning

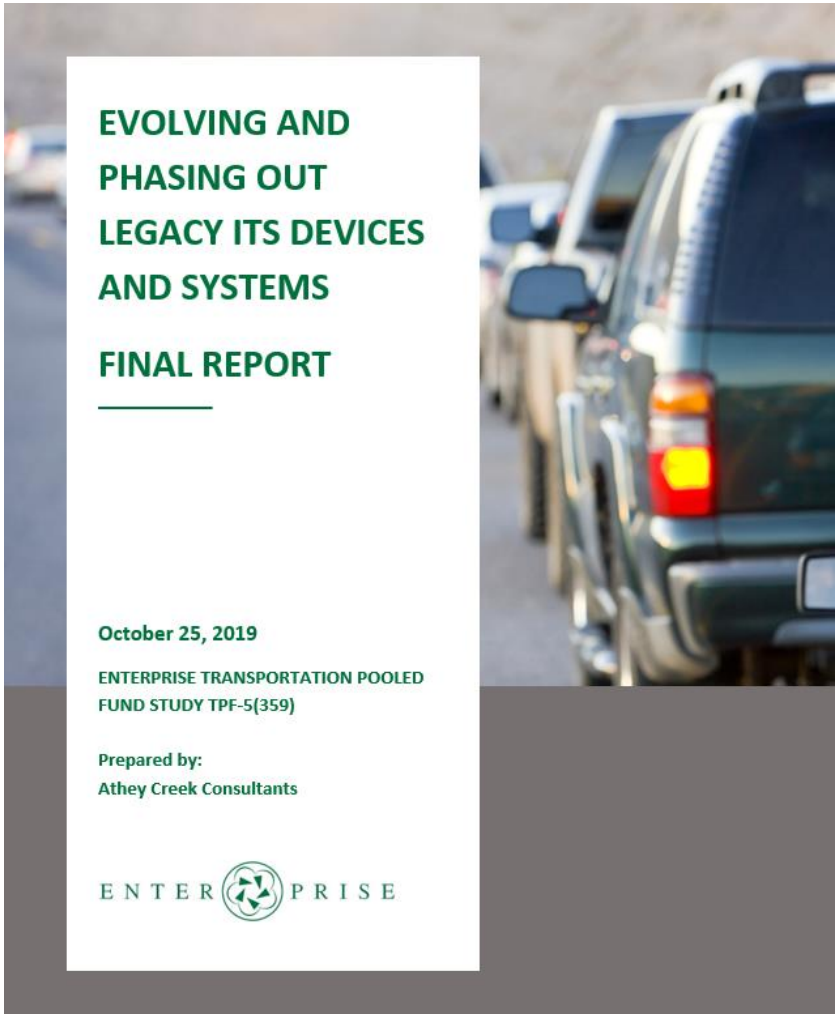
Michigan DOT - ITS Device Obsolescence and Modernization Planning

- 5-year ITS Device Modernization Plan (DMP)
  - ***Proactively evaluate*** all ITS devices, environmental sensor stations, CAV devices that have reached technical obsolescence or high probability of failure in next 5-10 years
- Annual DMP Maintenance:
  - ***Evaluate devices:*** state of the practice, maintenance history, technological characteristics, value to the motoring public
  - ***Recommend devices for removal***

Final Report

Published on ENTERPRISE Pooled Fund website: http://enterprise.prog.org/

- Projects ==> Completed
- *Evolving and Phasing Out Legacy ITS Devices and Systems*



Thank You!

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Round Robin

NWP Members

- Washington
- Idaho
- Wyoming
- Montana
- North Dakota
- South Dakota
- Minnesota

ITS Devices and Systems that your state is evolving or phasing out?

- HAR
- Traveler Information Phone Service
- Traveler Information Websites and Mobile Apps
- Signs and Traffic Control Devices
- Traffic Detection
- Monitoring Devices
- Traffic Cameras
- TMC Facilities and Operator Support
- ITS Communications Systems
- Agency-owned Devices vs. Service-based Solutions

Upcoming Webinars

Month	Meeting Topic
Nov 18, 2020 2:30 – 3:30 pm (CT)	**Small Cell Deployments in the ROW** Round Robin/Discussion from NWP Members States
Dec 16, 2020 2:30 – 3:30 pm (CT)	**NCHRP 08:120 – Initiating the Systems Engineering Process for Rural CV Corridors** • Presenter: Barbara Staples, Noblis
Jan 20, 2021 2:30 – 3:30 pm (CT)	**Minnesota DOT: Fiber Planning Exercise** • Presenter: Cathy Heubsch, MnDOT
Feb 17, 2021 2:30 – 3:30 pm (CT)	**Project Ideas Work Plan 16** • Task Force Members **North Dakota DOT Autonomous Attenuator** • Presenter: Brandon Beise
Mar 17, 2021 2:30 – 3:30 pm (CT)	**FCC Rule Making and Reallocating the Spectrum**
May 19, 2021 2:30 – 3:30 pm (CT)	**Round robin member highlights and discussion from the 2020-21 winter and flood season**
Jun 16, 2021 2:30 – 3:00 pm (CT)	**Project 15.7: State Weather Messaging Coordination – Project Results**
Jul 21, 2021 2:30 – 3:00 pm (CT)	**Update on WZDx Grant (30 min)**
Aug 25, 2021 2:30 – 4:00 pm (CT)	**Technician's Forum (90 min)**

Wrap Up

Thank You