Cap East Connector
ACES Shuttle:
Project Scope and Outlook

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The next 15 years in transportation will be more transformative than any time in our history

- Highly automated vehicles will begin to enter and disrupt the market
- Downtown cores and interstates will be the first movers
- Crashes will decrease and the types of crashes in the mix will change
- The transition offers many challenges and unanswered questions
CAP EAST CONNECTOR – ACES SHUTTLE: PROJECT SCOPE AND OUTLOOK

WISCONSIN AUTOMATED VEHICLE PROVING GROUNDS

- Comprehensive Spectrum of Testing/Research Environments
- Computer Simulation
- Virtual Reality Simulation
- RC Car and Golf Cart Modeling
- Closed Course MGA
- Controlled Campuses RA, Epic
- Public Road Corridors

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CAP EAST CONNECTOR – ACES SHUTTLE: PROJECT SCOPE AND OUTLOOK

WISCONSIN AUTOMATED VEHICLE PROVING GROUNDS
ACES

CV

Shared

AV

EV

V2V

V2I

V2X

IoT
Biggest Issues Surrounding AV/CV

- Vehicle Cybersecurity
- Information Privacy
- Vehicle Ethics
- Crashworthiness
- System Disengagements / Driver Re-Engagement
- Complex Driving Situations
- Deep Learning / Artificial Intelligence
- Vehicle Assertiveness
- Technology is coming – Will we shape it or let it shape us?
Bringing an Automated Vehicle to Madison
Who’s Been Involved in the Process?

- **City of Madison**
  - Department of Transportation (Traffic Eng., Parking Utility, Metro Transit)
  - Mayor’s Office
  - Office of Business Resources / Economic Development
  - Madison Transportation Commission
  - Citizens (Alders, Neighborhood Associations)

- **UW-Madison**
  - Engineering (Civil and Environmental, Mechanical, Electrical, Industrial Systems)
  - Planning
  - Computer Science
  - Design Innovation Lab
  - Administrators (Transportation Services, UWPD, Community Relations, Risk Management, Corporate Relations, Legal)

- **Public/Non-Profit**
  - Downtown Madison, Inc.
  - Madison Central BID
  - Greater Madison Chamber of Commerce
  - Dane County and RSVP of Dane County
  - Greater Wisconsin Agency on Aging Resources
  - Wisconsin Rural Partners
  - WisDOT, WSP, Wisconsin DMV

- **Industry**
  - CapEast Businesses (Festival Foods, Gebhardt, Brink, Big Top Sports, Old Sugar Distillery, Bos Meadery)
  - American Family Insurance
  - Madison Gas and Electric
  - AVPG Test Tracks (MGA, Road America)
  - Others (Green Cab, Schmidt’s Towing, Mandli, Continental Mapping, Epic, TAPCO, local entrepreneurs)
Process Timeline

Q4 2015 – Q1 2016: Madison Smart City Challenge
Q4 2016 – Q1 2017: Wisconsin AV Proving Grounds established
Q2 2017: Park Street Connected Corridor established
Q4 2017: First AV Shuttle demo (static demo)
Q2 2018: Second AV Shuttle demo (750 Rides)
Q4 2018: AmFam agrees in principal to fund a UW shuttle
Q1-Q2 2019: Stakeholder outreach and legal/liability issues
Q2-Q3 2019: RFI to potential vendors, Governor approval of purchase
Q4 2019/Q1 2020: RFP for shuttle to be let and shuttle selected
Q2 2020: Shuttle arrives and testing occurs
Q3 2020: AV shuttle begins public demos on Spark to Square Route
WiscAV ACES Shuttle S2S: CapEast Proposed Route
Deployment Strategy – Near Term

- Limited CapEast demonstrations
  - Saturdays for the Dane County Farmers’ Market
  - Other special events
  - User-group demo days
  - Emphasis on safety

- Establish data collection system

- Closed-course testing

- Virtual Simulation

- Secure funding for additional research, testing, and deployment
Operational Plan – Safety and Mobility Data

ROADWAY INTERACTIONS
- Other Vehicles
- Pedestrians
- Bicyclists
- Infrastructure

USER INTERACTIONS
- User Acceptance
- Passenger Comfort
- Usage Statistics
- Survey Responses

SYSTEM DATA
- Basic Vehicle Data
- Sensor Data
- Operating Data
- Vehicle Security

OPERATIONAL DATA
- Operating Limitations
- Obstacle Detection
- Winter Performance
- Changing Traffic Patterns

CONNECTED DATA
- Vehicle to Infrastructure
- Vehicle toAnything
- External Sensors
- Data Processing
WiscAV Shuttle ADS Grant Overview

- Demonstrations
- Safety Performance
  - Performance Measures for Safe Operation of AVs
  - AV Interaction with Pedestrians and Bicyclists
  - Advanced Communications System
  - Simulation for Safety Characterization of AVs
- Operational Impacts
- Agency Needs
  - Law Enforcement and Traffic Records Data Needs
  - Pavement Marking Maintenance Standards
  - Registering, Licensing, and Insuring AVs
- Transit Integration
- User Acceptance
  - User Trust
  - Equitable Access
- Data Sharing
- Outreach
  - State DOT and City
  - Wisconsin Rural
  - National Rural
# Current Program Timeline

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<tr>
<th>UW-Madison</th>
<th>AmFam</th>
<th>City of Madison</th>
<th>TAPCO</th>
<th>MGA</th>
<th>Other Partners</th>
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Closed-Course Testing

- ADS Operational Design Domain Testing
  - Vehicle Performance including AEB, pedestrian detection, grades, environmental factors, and parking
  - Traffic/Obstacle Performance including vehicle interaction, parked cars, structures, emergency vehicles, and roadway obstructions

- Consumer Safety Testing Protocols including IIHS and EuroNCAP
Living Lab – Smart Intersection

- A combined DSRC/LTE-V2X roadside unit (RSU) and necessary hardware to integrate the device into the controller – To communicate SPaT and other messages to the vehicle (1, 2)
- Wireless access points – for vehicle and VRU localization (1, 2, 3)
- LiDAR sensors – to validate detection of VRUs (2, 3)
- A 360 degree video camera – to validate detection of VRUs (1)
- Edge computer – to process data and communicate with the data center (4)
- Other controller hardware (4)
Simulation Environments

- Recreate corridor in virtual simulation and driving simulator environments
- Software-in-the-loop testing
  - Synthetic sensor data
  - Scenario development
  - Data analysis
- Human-user interaction and human factors research
- Near-Miss Categorization
Engaging Stakeholders

- User Acceptance
  - Community demonstrations
  - Vulnerable road users
  - Equitable access
  - Outreach/Public Reaction
- Law enforcement and traffic records data needs
- Registration / licensing / insurance
- Transit integration / training
- City and state data needs
Next Steps

Additional Routes
- Madison First/Last Mile Route
- UW-Madison Route
- Community/Technical College Routes
- Brown County AV Route(s)
- SE Wisconsin Route(s)

Additional Vehicles
- Integrating vehicles with transit (dynamic routing)
- Closed course scenario testing and standards development
- High speed AVs on freeways, rural two-lane arterials

Additional Data
Thank You

Stay Engaged

Visit: WiscAV.org

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