DISRUPTIVE FORCES AT WORK

We’re on the cusp of a transformation in transportation, driven by advances in vehicle Automation, Connectivity, Electrification and Sharing. The changes will be disruptive for transportation system design and operations.
CHALLENGE

• Integration of emerging transportation technologies into the existing operations environment
  • Long transition period
  • Uncertainty regarding:
    • Technologies
    • Resource needs
    • Standards
    • Business models
USDOT POLICY – AUTOMATED DRIVING SYSTEMS 2.0

• Vehicle Focused
  • Automated Driving Systems (ADS) designed for current Operational Design Domains (ODD)
  • Silent on need for new infrastructure standards and operations paradigms
  • Perpetuates silos between vehicle and infrastructure design
OPERATIONAL DESIGN DOMAIN

• USDOT Policy Minimums:
  • Facility Type
  • Geographic Area (Urban/Rural)
  • Speed Range of Vehicles
  • Environmental Conditions

• Let’s Add:
  • Level of Connectivity (V2X)
  • ITS and Traffic Management Infrastructure
  • Communications/Network Infrastructure
  • Electrification Infrastructure
  • Data Management Environment
  • Inter-Modality
  • MaaS Environment
  • Regulatory / Enforcement Considerations
  • Roadway Conditions
  • Mapping & Location Services
TRANSFORMATION OF THE DESIGN DOMAIN

• Collaborative, proactive approach needed to support emerging mobility solutions

• Understanding nuances of ADS behavior for safe transportation system design and operations

• Understanding ADS use cases to create an integrated environment for automated driving
DISRUPTION CREATES OPPORTUNITY
BUSINESS CASES FOR AUTOMATION

- Urban applications – shared use vehicles
- Intermodal facilities – first and last mile opportunities
- Residential and campus applications
- Highway maintenance operations
- Truck automation and platooning

HNTB
AUTOMATED VEHICLE PROVING GROUNDS

- ADS test case validation
- Infrastructure test case development and validation
- Opportunity for collaboration among government, business and research communities
- Opportunity to design and test infrastructure and operations modifications for ADS
Transitioning on our highways

- Transition period will be challenging for operations
- Managed lanes in a new context
- Should we separate automated vehicles from others to generate the most benefits?
- At what penetration rate should we dedicate a lane?
- Incrementally increase the number of special lanes as the fleet turns over?
OPPORTUNITIES FOR CONNECTIVITY

• Data acquisition and management to support operations
• V2I applications for improved safety and mobility on freeways and arterials
• R.E.S.C.U.M.E. applications to support TIM and emergency operations
VEHICLE-TO-INFRASTRUCTURE HUB FRAMEWORK

- Infrastructure Data and Display Systems
- Vehicle-to-Infrastructure (V2I) Hub Platform
  - Local interface system supporting collection, integration and dissemination of data between infrastructure and vehicles
- Traffic Management Entity
- Vehicle and Nomadic Device Application Platforms
OPPORTUNITIES FOR ELECTRIFICATION

• Battery Enhancements
• Infrastructure Enhancements
  • Grid Modernization
  • Charging Stations
• Innovations
  • Wireless Induction
  • Dynamic Induction
  • Electrified Roadways
SHARED MOBILITY OPPORTUNITIES

• Integrated Intermodal Information and Payment Solutions

• Mobility Hubs
  • Centers for Shared Mobility Services
  • Design, Deployment, Operations

• Partnership and Integration with Transit
  • Off-Peak Solutions
  • First and Last Mile Solutions
  • Lesser Used Routes
INFRASTRUCTURE IMPACTS

- The “Automated Highway”
  - Integrating automation into design and operations
  - Automated control functions (signs, signals, markings, lane controls, barriers)
  - Automated payment systems

Source: University of Texas
WHAT’S NEXT?

Flying cars, “mobile homes” and riding in tubes at the speed of sound
EMERGING MOBILITY SOLUTIONS

- Integration of automated, connected, electric and shared vehicles into the existing design and operations environment will be challenging.
- Engineering and operational concepts, performance measures, algorithms, the transportation workforce, design standards, traffic control systems, and policies will be transformed.
- We must be collaborative, nimble and resourceful.

Above all, we must be proactive.