CONNECTED VEHICLE PILOT Deployment Program

ICF/Wyoming

Kate Hartman (ITS JPO), ICF/Wyoming CV Pilot Site COR
OVERVIEW

- Connected Vehicles Pilot Deployment Program Overview
  - Goals
  - Organizing Principles
  - CV Applications
  - Program Schedule and Future Milestones
  - CV Pilots Wave 1 Sites:
    - ICF/Wyoming, New York City, Tampa (THEA)
- ICF/Wyoming CV Pilot Deployment Overview
  - Pilot Objective
  - Pilot Deployment Site
  - Pilot Site Needs, CV Applications and Performance Measures
  - Fleet Distribution
  - Pilot Deployment Vision
  - Timeline and Phase 1 Deliverable Schedule
- How to Stay Connected
The Connected Vehicle (CV) Pilot Deployment Program
- Keystone effort in connected vehicle area
- Also plays a key role in other strategic areas, including accelerating deployment, promoting interoperability, and enterprise data

CV Pilot Deployments offer a unique opportunity related to getting CV technology to the field and making a difference in many areas, including:
- Needs-driven planning and investment
- Integrated performance measurement
- Lowering barriers to deployment

USDOT ITS Strategic Plan, pg. 14
CV PILOT DEPLOYMENT PROGRAM GOALS

Spur Early CV Tech Deployment
Wirelessly Connected Vehicles
Mobile Devices
Infrastructure

Measure Deployment Benefits
Safety
Mobility
Environment

Resolve Deployment Issues
Technical
Institutional
Financial
CV PILOT ORGANIZING PRINCIPLES

- CV Pilots are *pilot deployments*, that is, real-world environment deployments
  - The successful, deployed technologies are expected to remain as permanent operational elements

- Deployment concepts are *needs-driven*
  - Each site has different needs, focus and applications
    - That is, each pilot deployment will address critical problem(s)
    - The needs of each site will drive the deployment process

- Pilot deployments are expected to be both *large-scale with multiple applications*
  - *Large-scale* implies pilot deployments will have measureable impact, not a specific minimum geographic or vehicle fleet size
  - Sites will deploy *multiple applications* drawing on the products of USDOT and other connected vehicle research
CV PILOT DEPLOYMENT REQUIREMENTS

- Multiple connected vehicle applications will be deployed together
- Pilot deployments should leverage USDOT-sponsored research
- Pilot deployments include the capture of data from multiple sources
  - Integrated or carry-in devices for connected vehicles capable of generating an SAE J2735 Basic Safety Message (BSM)
  - Look to pilot deployment data while protecting privacy and intellectual property
- Dedicated Short Range Communications (DSRC) 5.9 GHz will be utilized as the communications technology
- Well-defined, focused, quantitative performance measures
  - Support an independent evaluation effort
- Security and credentialing management system
The USDOT has made a significant investment in foundational research and initial development of 50+ connected vehicle applications

- Concepts of Operations
- System Requirements
- Prototype Design and Testing
- Prototype Impacts Assessment
- Analytics, Modeling and Simulation to Assess Potential Long-Term Impacts

Not all CV Application efforts are in the same state of maturity, few are complete

- But a large number of application development efforts across multiple programs have been completed
- GOAL: move deployment-ready application concepts forward into integrated deployments addressing key performance concerns
## USDOT Sponsored CV Applications

### V2I Safety
- Red Light Violation Warning
- Curve Speed Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

### V2V Safety
- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

### Environment
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Cooperative Adaptive Cruise Control
- Eco-Traveler Information
- Eco-Ramp Metering
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System
### USDOT Sponsored CV Applications (Cont.)

#### Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Cooperative Adaptive Cruise Control (CACC)
- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
- Emergency Communications and Evacuation (EVAC)
- Connection Protection (T-CONNECT)
- Dynamic Transit Operations (T-DISP)
- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance Measurement (F-ATIS)
- Drayage Optimization (DR-OPT)

#### Road Weather

- Motorist Advisories and Warnings (MAW)
- Enhanced MDSS
- Vehicle Data Translator (VDT)
- Weather Response Traffic Information (WxTINFO)

#### Smart Roadside

- Wireless Inspection
- Smart Truck Parking

#### Agency Data

- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information
CV PILOT DEPLOYMENT PROGRAM SCHEDULE: WAVE 1 (PHASES 1-3)

- **Phase 1: Concept Development (Current Phase)**
  - Creates the foundational plan to enable further design and deployment
  - **Progress Gate: Is the concept ready for deployment?**

- **Phase 2: Design/Deploy/Test**
  - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - Progress Gate: Does the system function as planned?

- **Phase 3: Maintain/Operate**
  - Focus is on assessing the performance of the deployed system
  - Post Pilot Operations (CV tech integrated into operational practice)
Solicitation Date: 1/30/2015

Award Date: 09/14/2015

Period of Performance: 09/14/2015 – 09/13/2016
Objective:
- Reduce the number and severity of adverse weather-related incidents (including secondary incidents) in the I-80 Corridor in order to improve safety and reduce incident-related delays.
  - Focused on the needs of the commercial vehicle operator in the State of Wyoming

Approach:
- Equip fleet vehicles (combination of snow plows, maintenance fleet vehicles, emergency vehicles, and private trucks) that frequently travel the I-80 corridor to transmit basic safety messages (BSMs), collect vehicle and road condition data and provide it remotely to the WYDOT TMCs
- Deploy DSRC roadside equipment (RSE) to supplement existing assets and initiatives
- Road weather data shared with freight carriers who will transmit to their trucks using exiting in-vehicle systems

Status:
- Kickoff conducted on 9/29-10/1
- ConOps under development
ICF/WYOMING PILOT DEPLOYMENT OBJECTIVE AND APPROACH

Phase 1
Led By ICF
Partners
- Wyoming DOT
- Trihydro
- NCAR
- Univ of Wyoming
- CATT Lab
- McFarland Mgmt

Phase 2
Led By Wyoming DOT
Partners
- Wyoming DOT
- Trihydro
- NCAR
- Univ of Wyoming
- CATT Lab
- McFarland Mgmt
New Partners
- DSRC Radio Vendors
- On-board equipment vendors
- Data providers
- Weather Sensor Developers
- Fleet Operators

Phase 3
Led By Wyoming DOT
Partners
- Wyoming DOT
- Trihydro
- NCAR
- Univ of Wyoming
- CATT Lab
- McFarland Mgmt
New Partners
- Fleet Operators

Stakeholders Engaged throughout Pilot
- Wyoming Trucking Association
- Wyoming Highway Patrol
- Wyoming Workforce Development
- Wyoming Chamber of Commerce
- Freight Operators
- Oil and Gas Industry Representatives
# ICF/Wyoming Pilot Deployment Team

<table>
<thead>
<tr>
<th>Project Sponsor</th>
<th>ITS Joint Program Office</th>
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<tr>
<td><strong>Prime Consultant</strong></td>
<td>ICF International</td>
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Transportation Issues Along the Wyoming I-80 Corridor

- Truck blow overs of high profile freight vehicles with wind speeds frequently exceeding 30 mph and wind gusts of 70+ mph
  - 2002-2012 over 3,472 high-wind crashes were observed
  - Over five years, 86 road closures averaging over 8 hours long with estimated $11.7 million economic cost due to each closure
  - In the past four years, 200 truck blow overs reported related to high-wind events
- Mix of passenger and commercial vehicles can result in catastrophic crashes, most recently in two separate 65-vehicle pileups in 2015
- Between 2009-2013, a total of 94 fatalities were observed
  - 11 fatalities as a result of snow (11.70%)
  - 2 fatalities as a result of rain (2.13%)
  - 5 fatalities as a result of other weather conditions (5.32%)
- Risky, aggressive passenger vehicle driving behavior (driving too closely, cutting off other vehicles to pass, or driving excessively fast to make up for lost time) due to slow moving commercial vehicles through areas of elevation changes
- Major truck corridor with the highest elevation along the entire length of transcontinental I-80
- Distance between towns range from 50 to 115 miles
- Limited parking and no alternate routes
ICF/WYOMING PILOT DEPLOYMENT SITE NEEDS: ROAD WEATHER INFORMATION

Reduce Truck and Vehicle Crashes

Road Weather Advisories for Trucks and Vehicles

Performance Measures
- Number of truck crashes due to weather
- Number of passenger vehicle secondary crashes due to weather

Improve Operational Effectiveness of Emergency Responders

Automated Notification of Emergency Responders

Performance Measures
- Average response times
ICF/WYOMING PILOT DEPLOYMENT SITE NEEDS: ROAD WEATHER INFORMATION

Improve Traveler Safety By Reducing Speed Variance

CV-enabled Weather-Responsive Variable Speed Limits

Performance Measures
- Speed variance
- Number of crashes
- Adherence to recommended speeds

Improve Truck Safety and Productivity

Truck Parking Availability for Freight Carriers*

Performance Measures
- Driver hours of service compliance
- Truck parking utilization
- Fleet operation efficiency

*Both a truck safety and road weather application
ICF/Wyoming Pilot Deployment

Site Needs: V2I Safety

Improve Driver Decision Making

- Spot Weather Impact Warning

Performance Measures
- Number of crashes

Improve Work Zone Safety

- Work Zone Warnings

Performance Measures
- Number of work zone crashes
- Adherence to posted speeds
ICF/WYOMING PILOT DEPLOYMENT SITE NEEDS: V2V SAFETY

Increase Awareness of Road Conditions

Situational Awareness

Performance Measures
- Number of crashes
- Adherence to speed advisories from vehicle
ICF/Wyoming Pilot Deployment Site Needs: Truck Safety

Improve Truck Safety

Freight-Specific Dynamic Travel Planning

Performance Measures
- Fleet management centers usage of CV data
## ICF/Wyoming Pilot Deployment Proposed CV Applications: Summary

<table>
<thead>
<tr>
<th>V2I Safety</th>
<th>Mobility</th>
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<tr>
<td>• Spot Weather Impact Warning</td>
<td>• Advanced Traveler Information System</td>
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<td>• Reduced Speed/Work Zone Warning</td>
<td>• Freight-Specific Dynamic Travel Planning and Performance Measurement (FRATIS)</td>
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ICF/Wyoming Pilot Deployment Proposed
CV Applications: Summary

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<tr>
<th>CV Application</th>
<th>WYDOT Snow Plows</th>
<th>WYDOT Maintenance Fleet Vehicles</th>
<th>Emergency Vehicles</th>
<th>Private Trucks/Commercial Vehicles</th>
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# Timeline - ICF/Wyoming

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- Public Webinar
## CV PILOTS PHASE 1 DELIVERABLE SCHEDULE

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<tr>
<th>Task Name</th>
<th>Deliverables</th>
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Join us for the *Getting Ready for Deployment Series* (link to webinars)
- Discover more about the Wave 1 CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

Website: http://www.its.dot.gov/pilots
Twitter: @ITSJPODirector
Facebook: https://www.facebook.com/DOTRITA

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