Insights, Challenges, and Lessons Learned from the Concept Development Phase – ICF/WYDOT Pilot Site
**TODAY’S AGENDA**

- **Purpose of this Webinar**
  - To share the Comprehensive Deployment Plan from the ICF/WYDOT with the stakeholders of connected vehicle technologies.

- **Webinar Content**
  - Connected Vehicle Pilot Deployment Program Overview
  - **ICF/WYDOT** Comprehensive Deployment Plan
  - Stakeholder Q&A
  - How to Stay Connected

- **Webinar Protocol**
  - Please mute your phone during the entire webinar
  - You are welcome to ask questions via chatbox at the Q&A Section
  - The webinar recording and the presentation material will be posted on the CV Pilots website
CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM

PROGRAM GOALS

- Participate in Concept Development Phase Webinars for the three Pilot Sites (see website for exact dates and times)

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- Visit Program Website for Updates: http://www.its.dot.gov/pilots
- Contact: Kate Hartman, Program Manager, Kate.hartman@dot.gov

PILOT SITES

ICF/Wyoming DOT
NYCDOT
Tampa (THEA)
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)
WYDOT’S PILOT DEPLOYMENT BACKGROUND
Wyoming’s I-80 Corridor

Heavy Freight Traffic
- Major E/W Freight corridor
- Freight over half of annual traffic

Severe Weather Conditions
- Roadway elevation,
- Heavy winds, heavy snow and fog
- Severe blowing snow and low visibility

Adverse Impacts on Truckers
- Higher than normal incident rates
- Multi-vehicle crashes
- Fatalities

Source: WYDOT (Dec 17, 2015)
CV Pilot Award

- September 2015
  - Phase I awarded
  - Kick-off meeting conducted
  - Activities begin

Since the kick-off...

WYDOT CV Pilot
I-80 Southern Wyoming
Reduce the impact of adverse weather on truck travel along the corridor through CV-based advisories, roadside alerts, parking notifications and dynamic traveler information.
Since the CV Pilot Kick-off Meeting

654 incidents involving commercial vehicles occurred on I-80 since project kick-off
Since the CV Pilot Kick-off Meeting

1,498 crashes
1,923 vehicles
$773.5M Societal Impact

Response to an incident on I-80

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<tr>
<th>Type</th>
<th>No.</th>
<th>Societal Impact</th>
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<tr>
<td>Fatality</td>
<td>13</td>
<td>$120,891,446</td>
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<tr>
<td>Injury</td>
<td>253</td>
<td>$110,578,475</td>
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<tr>
<td>Property Damage</td>
<td>1,232</td>
<td>$542,080,000</td>
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Economic impacts based on figures provided by WYDOT Public Safety. Assumes one moderate injury or one fatality per crash.
Since the CV Pilot Kick-off Meeting

Over the past year...

- **250 Hours** Full Lane Closures
- **~180 Hours** High Profile Vehicle Restriction
- **37 Days** Inclement Weather
WYDOT’s Commercial Vehicle Operator Portal (CVOP)

Created for trucking community and designed with their input. Includes:

- Road weather forecasts (surface conditions, visibility, wind)
- Pre-event forecast information through FHWA’s RWMP’s Pathfinder initiative

The need for actionable information is growing

**Estimated Firms Subscribed to WYDOT’s CVOP**

**Sept 2015**

- 150

**Downloads of WYDOT 511 App**

**Aug 2016**

- 800
- 26,443

*Downloads since Feb 2016 when app was released*
Freight firms across the country need I-80 travel information.
Need to Reduce Workplace Fatalities

Supported by trucking industry leaders and safety advocates across the state

“WTSC is very supportive of WYDOT’s continuing efforts…[they] will have huge, positive impacts on highway safety in this state…”

 “…WTA looks forward to a continued partnership with WYDOT in these efforts”

3x higher

Average rate of deaths per 100,000 FTE workers is 3x greater than the national average

50%

50% of state operational fatalities in 2014 were transportation related

Performance Improvements

Road Weather Condition Input
1. Improve road weather condition reports received into the TMC

TMC Information Dissemination
1. Improve ability of the TMC to generate wide area alerts and advisories
2. Efficiently manage closures, restrictions and speed limits
3. Effectively disseminate and receive messages from TMC to en-route vehicles
4. Improve information to commercial vehicle fleet managers

Vehicle/Roadside Alerts & Advisories
1. Effectively transmit and receive V2V messages to reduce incidents and their severity
2. Enhance emergency notifications of a crash

Outcomes
1. Improve speed adherence and reduce speed variation
2. Reduce vehicle crashes
Impacts of WYDOT’s CV Pilot

Enhanced:
• Safety
• Mobility
• Reliability
• Productivity

- Wyoming I-80 Drivers
  • Safer and faster travels on I-80
  • Increased amount and reliability of available information

- Fleet Managers
  • Improved truck and driver productivity and safety

- WYDOT
  • Reduced crash and road closure
  • Improved emergency management
  • Enhanced data collection and dissemination capability

- US DOT
  • Sustainable momentum for nationwide innovation and further deployment of CV-technologies
WYDOT’S PILOT DEPLOYMENT PLAN
Wyoming Connected Vehicle Pilot

- Integrated with TMC
- Freight Focused
- DSRC Based
- Integrated with WYDOT Fleets
- Forward Looking

Future NEXT EXIT
WYDOT Pilot: DSRC-Based

CV Environment
75 Roadside Units on I-80
400 Vehicles with DSRC Connectivity

V2V Applications
Forward Collision Warning
Distress Notification

V2I Applications
Situational Awareness
Spot Weather
Work Zone Warning
WYDOT Pilot: Freight Focused

CV Trucks
~150-200 large trucks
~100 small/medium trucks

Fleet Partners
National and Local Truck Companies

Freight Partners
CVOP Users (800 firms)
Wyoming Trucking Association
Third Party Intermediaries
WYDOT Pilot: Integrated with TMC

- Supports I-80 Traveler Information
- Supports VSL and other traffic management strategies
- Integrated with TMC Management Systems

WYDOT’s VSL, 511 and other services will rely on CV data
WYDOT Pilot: Integrated with WYDOT Fleets

- Environmental Probe Data Collection
- Leverage existing technology
- ~100 DSRC-enabled snow plows and highway patrol vehicles

WYDOT’s use of its own fleets in the CV pilot will allow for continued operations post pilot.
WYDOT Pilot: Forward Thinking

- Standards-Driven
- Integration with Third-Party Intermediaries
- Integration with Satellite Delivery of TIMs
- Close coordination with other CV sites

Forward Thinking
WYDOT’S PILOT SYSTEM
OVERVIEW
System Overview
Vehicle System

All vehicles that are part of the vehicle system will have:

- Ability to share information via DSRC with connected devices (vehicles and RSUs)
- Ability to broadcast Basic Safety Message Part I
- Ability to receive Traveler Information Messages (TIM)
- Human-Machine Interface (HMI) to communicate alerts and advisories to driver

Vehicle Sub-Systems
1. WYDOT Fleets
2. Integrated Trucks
3. Retrofit Vehicles
4. Basic Vehicles

On-board Vehicle Technologies
- OBU with DSRC only
- OBU with DSRC and Satellite Receiver
- Human Machine Interface
- CAN Bus Integration
- Environmental Sensors
Wyoming CV System

Ingests and processes CV data
Generates alerts and advisories
Brokers data between internal and external systems
Generates and distributes TIMs
Stores data for performance management

Wyoming CV Pilot System

External Interfaces
- US DOT Interfaces (e.g. SCMS)
- WYDOT Interfaces (e.g. ATMS and ATIS Systems at the TMC)
- Weather

CV Subsystems
- Roadside Units
- Operational Data Environment
- PikAlert® System
- WYDOT Data Broker
- WYDOT Data Warehouse
CV Applications Overview

On-Board Applications
- Applications available to equipped vehicles

TMC Ops Applications
- Support for WYDOT Traveler Information and Traffic Management
On-Board Apps
Forward Collision Warning

- Impending front-end collision warning
- Data sent to approaching vehicles (from vehicle 1 to vehicle 2)
- Same direction of travel
- All roadway geometries
• Probe data collected from WYDOT fleet to supplement existing observations
• Downstream road conditions (speed and vehicle restrictions, incidents, parking, road closures etc.) sent via a Traveler Information Message (TIM)
• Similar applications included in the pilot:
  o Work Zone Warning: Unsafe work zone conditions (obstructions, closures, shifts, etc.)
  o Spot Weather Impact Warning: Localized road weather information (fog, ice, etc.)
On-Board Apps
Distress Notification

- Generation and broadcast of distress message (e.g., Mayday)
- CV and RSU within vicinity receive and forward message
PHASE I ACCOMPLISHMENTS AND LESSONS LEARNED
Phase I Achievements

WYDOT Phase I planning achieved successful incorporation of USDOT CV required elements:

- Applications supporting a real need
- DSRC integration
- SCMS use and interfaces
- Share data
- Develop open source code
- Use of CVRIA and SET-IT tools
- Successful team framework

Approved Phase I documents:

- Program Management Plan
- Concept of Operations
- Security Management Operational Concept
- Safety Management Plan
- Performance Measurement and Evaluation Support Plan
- Application Deployment Plan
- Participant Training & Education Plan
- Deployment Outreach Plan
Lessons Learned (1 of 3)

- Be prepared for concept evolution – must meet real needs!
- Leverage existing resources but understand limitations with respect to pilot
- Developing verifiable system requirements is challenging in the CV arena
- Develop an approach to integrate CV pilot with existing transportation systems management and operations
Address commercial operator’s priorities and concerns (privacy, liability, flexibility)

Once initial concept and user needs are stable, engage with vendors

Plan with post-pilot operation in mind

Balance data needs (privacy/security vs. performance measurement)
Formalized agreements with private partners take time. Start with initial letters of support

Engage procurement and contracting personnel early

Leverage local stakeholders and champions. Engage leadership early

Be opportunistic. Take advantage of evolving trends and interest
PHASE 2 AND PHASE 3

MOVING FORWARD
Phase 2 and Phase 3 Approach

Results of Phase 1 Planning + New Staff Capabilities + Finalized Partnerships = Phase 2 and 3 Approach

- Robust ConOps
- Verifiable System Requirements
- IRB Approval
- Strong PMBOK based management
- Vendor Engagement
- PM Planning

- Additional SE Staff
- Testing and Readiness Expertise
- Software developers
- Outreach experts

- Finalized Memorandums of Understanding
- Finalized scope of work
- Vendor specification documents
- Internal workload management

- Agile Application development
- Leveraging winter of 2017 to test early concepts
- Strong outreach plan
- Comprehensive Performance Management
Partnership Framework

- **Freight Partners**
  - CVOP Subscribers
  - Third Party Services
  - Trucking Fleets
  - Freight Distribution Centers

- **Other Stakeholders**
  - Independent Evaluator
  - IRB
  - Trucking Association
  - Other CV Pilot Sites

- **Subcontractors**
  - Technical and Program Support
  - System Developers and Integrators
  - Human Use and Training

- **Vendors**
  - CV equipment
  - Installation and support
  - Other hardware and software

**Internal Partnerships**

- WYDOT
Next Steps and Activities

- Updates to all Phase I documents (2016)
- Formalizing partnerships with fleet partners (Early 2017)
- System architecture and design development (Early 2017)
- Acquisition and Installation Planning and Procurement (Throughout 2017)
- Application development (throughout 2017)
- Early testing of applications (winter of 2017)
### Next Steps and Activities

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<td>Operational Readiness Testing in early 2018</td>
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<td>System Operations and Maintenance starting May 2018 for 18 months</td>
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<td>Post-Pilot Transition Planning</td>
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<td>Support for performance measurement and evaluation (throughout)</td>
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<td>Standards support (throughout)</td>
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<td>Stakeholder outreach (throughout)</td>
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- Please use chatbox to ask questions

- Questions will be answered in the order in which they were received
Contact for CV Pilots Program:
Kate Hartman, Program Manager
Kate.Hartman@dot.gov

Join us for the *Getting Ready for Deployment* Series
- Discover more about the CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
Twitter: [@ITSJPODirector](https://twitter.com/ITSJPODirector)
Facebook: [https://www.facebook.com/USDOTResearch](https://www.facebook.com/USDOTResearch)

CV Pilot Sites’ Comprehensive Deployment Plan Webinars

- **August 22 2016 /1:00-2:00 pm (Eastern)**
  ICF/WYDOT Comprehensive Deployment Plan Webinar

- **August 22 2016/3:00-4:00 pm (Eastern)**
  NYCDOT Comprehensive Deployment Plan Webinar

- **August 19 2016/1:00-2:00 pm (Eastern)**
  Tampa (THEA) Comprehensive Deployment Plan Webinar

Please visit the CV pilots website for the recording and the briefing material of the previous webinars.