



U.S. Department of Transportation
Federal Highway Administration



Vehicles To Infrastructure (V2I) Deployments



Topics of Discussion

1. The Big Picture – A Fully Connected Transportation System
2. Parallel Research Efforts In Connected Vehicle Applications
3. Vehicle-to-Infrastructure (V2I) Communication [Examples/Video]
4. Next Steps & How To Get Involved
5. 2015 FHWA V2I Deployment Guidance/Products



The Big Picture – A Fully Connected Transportation System

- ✓ The USDOT is interested in developing and deploying a fully connected transportation system that utilizes the most of multi-modal applications.
- ✓ The connected vehicle research has been organized into three (3) focus areas: 1) Connected Vehicle Applications, 2) Connected Vehicle Technology, and 3) Connected Vehicle Technology Policy and Institutional Issues.

Connected Vehicle Research - http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm





Parallel Research Efforts In Connected Vehicle Applications

- ✓ Connected Vehicle (CV) Applications are being expanded using real-world problems among various USDOT divisions, in parallel, based on a collaborative effort.
- ✓ At this moment, the CV applications constitute six (6) areas of parallel research [*Lead USDOT Division*]:
 - 1) Vehicle to Vehicle Communication for Safety [*NHTSA*];
 - 2) Vehicle to Infrastructure Communication for Safety [*FHWA*];
 - 3) Dynamic Mobility Applications [*ITS-JPO/ FHWA*];
 - 4) Road Weather Management [*ITS-JPO/ FHWA*];
 - 5) Application for the Environment [*ITS-JPO/ FHWA*];
 - 6) Real Time Data Capture and Management [*ITS-JPO/ FHWA*].





[FHWA] V2I Communications (Video)

Honda Demonstrates Advanced V2P and V2M Safety Technologies

From Honda Government Relations [4 minute video presented September 2013]

Summary of Video:

- ✓ Honda demonstrated two experimental safety technologies aimed at reducing the potential for collisions between automobiles and pedestrians and between automobiles and motorcycles.
- ✓ First, Honda R&D has successfully demonstrated the ability of a car equipped with Dedicated Short Range Communications (DSRC) technology to detect a pedestrian with a DSRC enabled smartphone.
- ✓ The other, Honda's Vehicle-to-Motorcycle (V2M) technology can determine the potential for a collision between a DSRC equipped motorcycle and automobile. Honda's press release has more.



Video: <http://vimeo.com/73407713>



[FHWA] Vehicle-to-Infrastructure (V2I) Communications

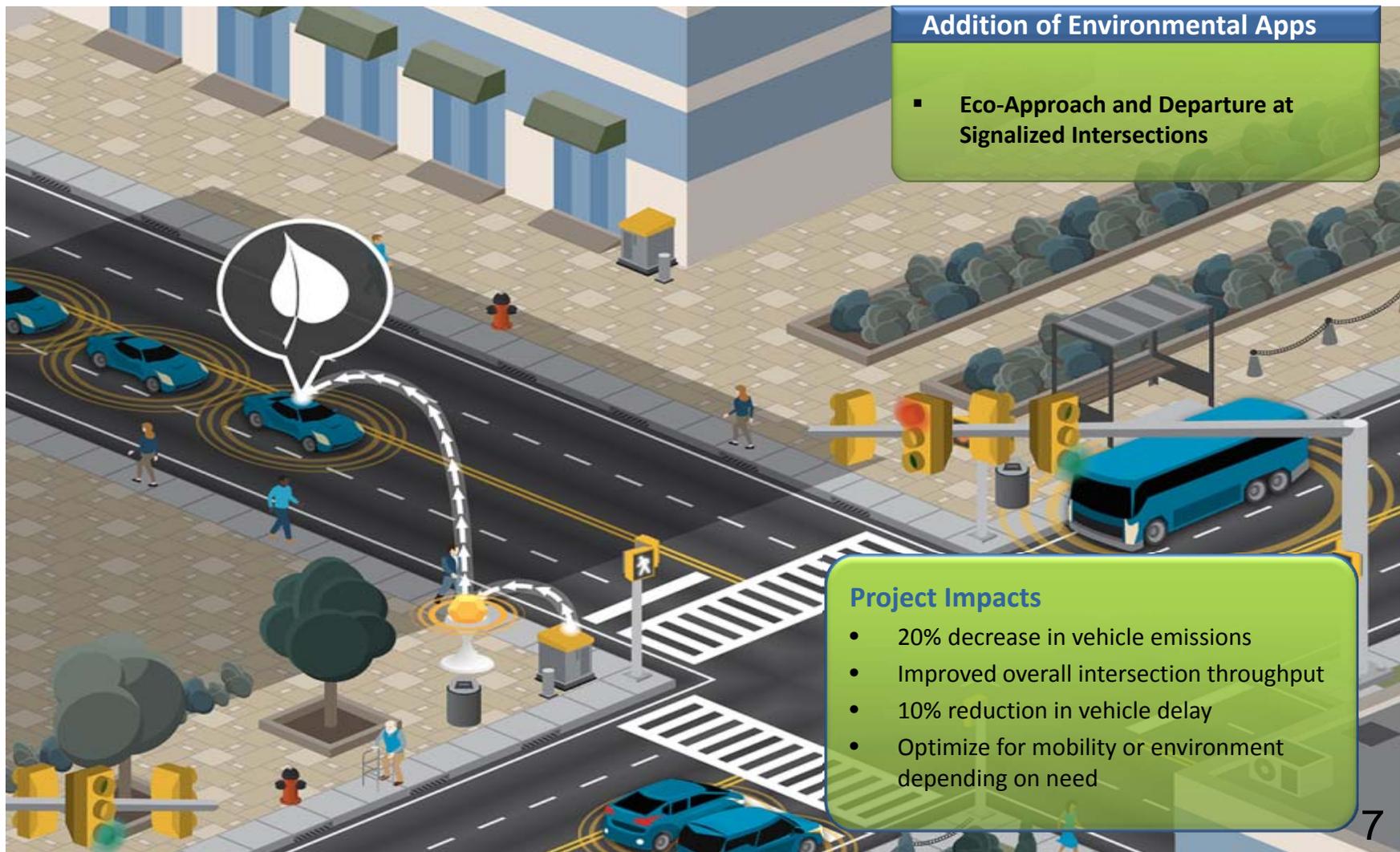
- ✓ This research investigates applications based on the relay of traffic signal phase and timing information to vehicles.
- ✓ The V2I applications are as followings:

Red Light Violation Warning (RLVW)	Curve Speed Warning (CSW)
Stop Sign Gap Assist (SSGA)	Spot Weather Impact Warning (SWIW)
Reduced Speed/Work Zone Warning (WZW)	Pedestrian in Signalized Crosswalk Warning (Transit - PSCW)



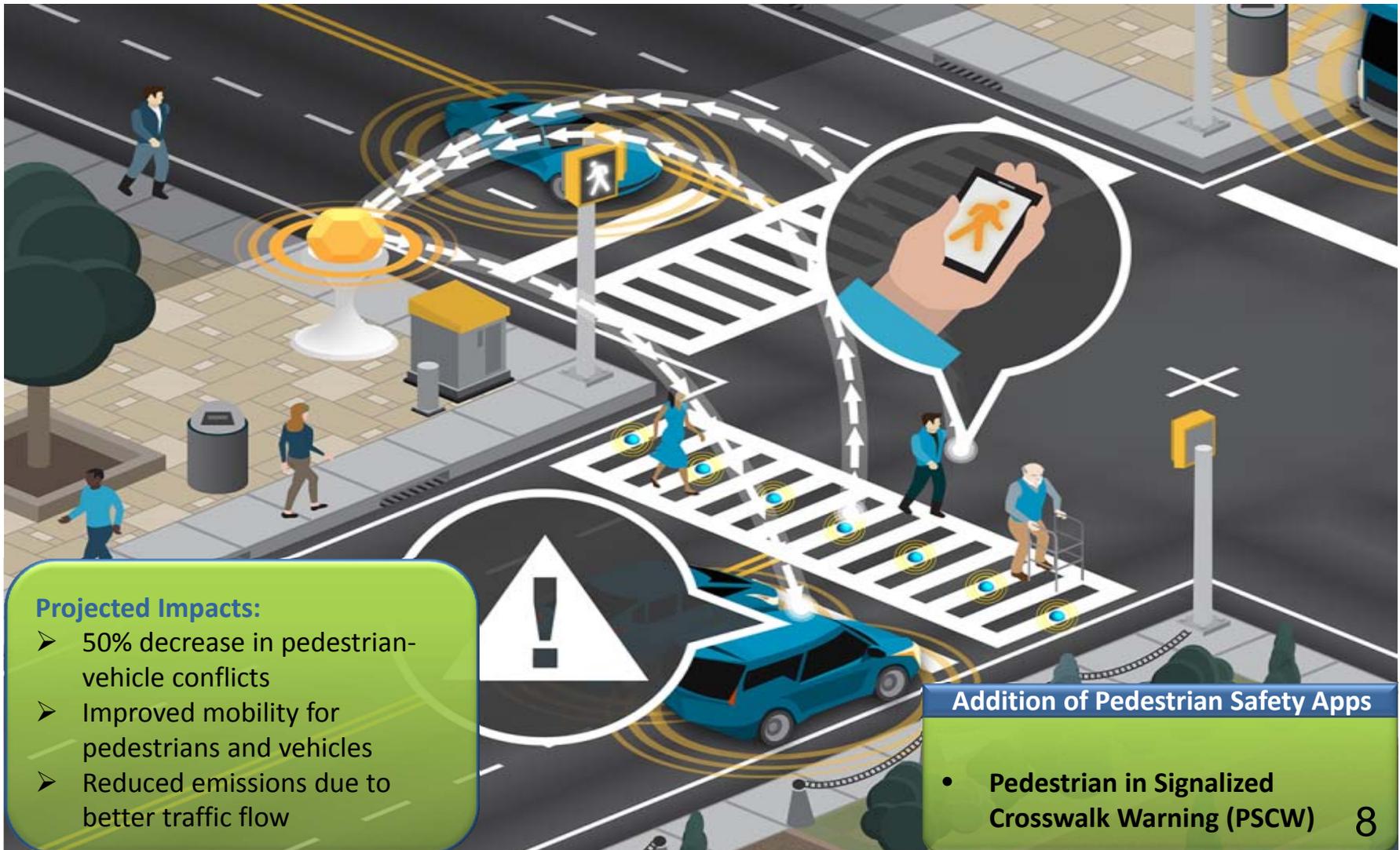


[FHWA] Vehicle-to-Infrastructure (V2I) Communications (Example)





[FHWA] Vehicle-to-Infrastructure (V2I) Communications (Example)





[FHWA] Vehicle-to-Infrastructure (V2I) Communications (Example)

Addition of Safety Apps

- Stop Sign Gap Assist (SSGA)



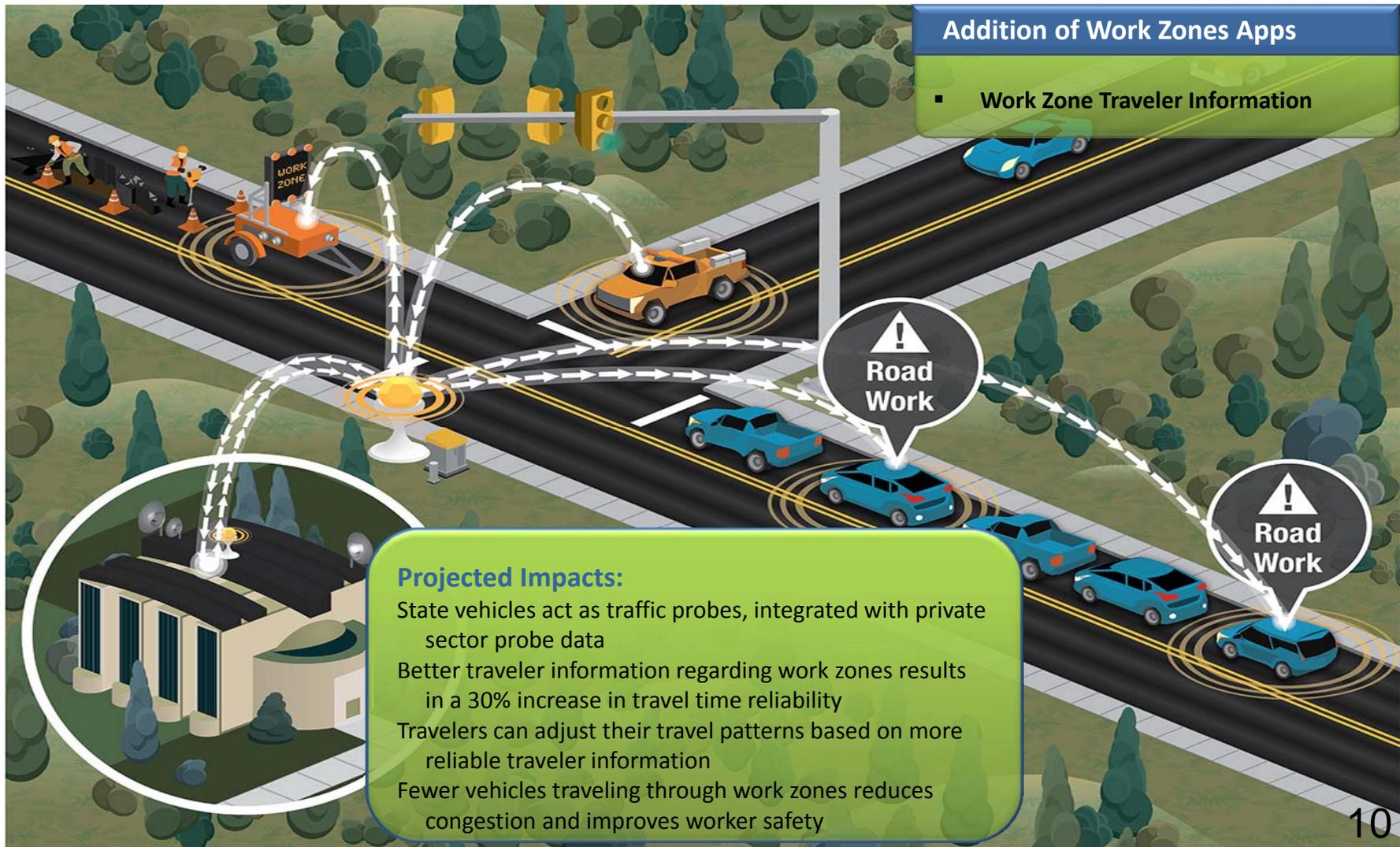
Projected Impacts:

- Significant reduction in collisions, injuries, and fatalities at intersections.
- Non-recurring congestion resulting from incidents is reduced by 30%

Stop Sign Gap Assist applications alert drivers when it is safe to depart from a stop sign



[FHWA] Vehicle-to-Infrastructure (V2I) Communications (Example)





Next Steps [NHTSA Issued ANPRM & Technical Report]

U.S. Department of Transportation Issues Advance Notice of Proposed Rulemaking to Begin Implementation of Vehicle-to-Vehicle Communications Technology (Dated August 18, 2014)
Report Number NHTSA 34-14

- ✓ The U.S. Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) released an advance notice of proposed rulemaking (ANPRM) and a supporting comprehensive research report on vehicle-to-vehicle (V2V) communications technology.
- ✓ The report includes analysis of the Department's research findings in several key areas including technical feasibility, privacy and security, and preliminary estimates on costs and safety benefits, while the ANPRM seeks public input on these findings to support the Department's regulatory work to eventually require V2V devices in new light vehicles.

Official Press Release:

<http://www.nhtsa.gov/About+NHTSA/Press+Releases/NHTSA-issues-advanced-notice-of-proposed-rulemaking-on-V2V-communications>

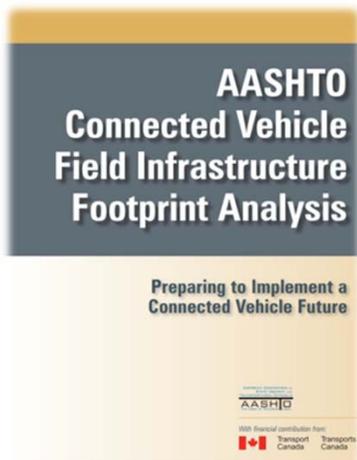


Next Steps [AASHTO CV Field Infrastructure Footprint Analysis]

- ✓ The American Association of State Highway and Transportation Officials (AASHTO), with the support of U.S. DOT and Transport Canada, has undertaken a Connected Vehicle Field Infrastructure Footprint Analysis for state and local agencies interested in deploying CV technology. to provide supporting information to agency decision-makers.
- ✓ The analysis estimates the total number of locations at which connected vehicle field infrastructure (V2I) may be deployed over the next twenty to twenty-five years.
- ✓ The vision for the infrastructure footprint anticipates a mature connected vehicle environment by 2040, by which time a large majority of vehicles on the roadway will be connected.
- ✓ From an infrastructure perspective:

- Up to 80% (250,000) of traffic signal locations will be V2I-enabled;
- Up to 25,000 other roadside locations will be V2I-enabled;
- Accurate, real-time, localized traveler information available on 90%;
- Next-generation, multimodal, traffic management will be deployed.

Source: http://ntl.bts.gov/lib/52000/52600/52602/FHWA-JPO-14-125_v2.pdf





Next Steps [Connected Vehicle Certification Lab]

- ✓ *Achieving V2V & V2I Interoperability* - It is the USDOT/FHWA intent to enter a Cooperative Agreement with one or more facilities that will conduct qualification and certification testing for various devices and applications used in large-scale connected vehicle deployment.
- ✓ The Cooperative Agreement will identify an approach for a Connected Vehicle Certification Testing program.
- ✓ A basic device consists of hardware, software and radio components which will certify the following:
 - Environmental Abilities (e.g., temperature, vibration, weather);
 - Communication Protocol Abilities (e.g., the radio service interoperability for DSRC);
 - Interface Abilities (i.e., both the message syntax and contents are formatted properly);
 - Overall Application Abilities (i.e., verifies the system level function)

RFA For CV – Next Stage Certification Environment

http://www.its.dot.gov/procurements/wireless_comm.htm





Next Steps [Vehicle-to-Infrastructure Deployment Coalition]

- ✓ The Vehicle-to-Infrastructure Deployment Coalition (V2I-DC) shall service as a focal point in Vehicle to Infrastructure (V2I) deployment on a national level by supporting federal, state, and local agencies.
- ✓ The V2I-DC will leverage a technical team comprising of the U.S. Department of Transportation (USDOT), Transportation System Owners/Operators, Owner/Operator Associations, Trade Associations, and other stakeholders.
- ✓ In support of the USDOT Vehicle-to-Vehicle (V2V) and V2I programs, the key objectives of the V2I Deployment Coalition will be as followings:
 - Vehicle-to-Infrastructure (V2I) Policy Guidance and Privacy Guidance;
 - V2I Readiness;
 - V2I Research;
 - V2I Standards and Deployment support;
 - V2I Outreach.

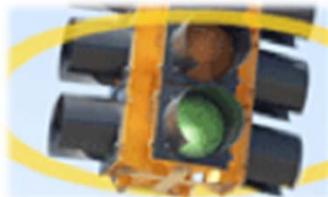


http://www.its.dot.gov/meetings/v2i_feedback.htm



Next Steps [2015 FHWA V2I Deployment Guidance & Products]

- ✓ This guidance is intended to assist FHWA staff and transportation system owner/operators deploy Vehicle to Infrastructure (V2I) technology not only in terms of the Federal-aid Highway program requirements but also practices to help assure interoperability and efficient & effective planning/procurement/operations.
- ✓ This guidance is intended to assist transportation agencies in making appropriate investment and implementation decisions when deploying connected vehicle systems.
- ✓ It does not negate or replace existing processes, but rather is intended to provide a clear statement of FHWA policy regarding such processes as planning, funding, siting, procuring, using, and providing access, among other critical actions.
- ✓ In the event that there are inconsistencies between this guidance and existing laws and regulations, the existing laws and regulations take precedence.



**Help develop the FHWA's
2015 Guidance for
Connected Vehicles.
Add your comment.**

http://www.its.dot.gov/meetings/v2i_feedback.htm

2015 FHWA Vehicle to Infrastructure Deployment Guidance and Products

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What is the Big Picture?

It is important for the State and local agencies to understand the following:

- a) What the decision could mean to them?
- b) What they need to know to prepare for an emerging connected vehicle environment?
- c) What investments could be made to leverage a nationwide fleet of equipped vehicles in support of State and local policies and/or operational objectives?



V2I Technology is NOT Mandatory

- Deployment of V2I technologies is NOT mandated and is NOT coupled with the National Highway Traffic Safety Administration's (NHTSA) advance notice of proposed rulemaking (ANPR) for Vehicle-to-Vehicle (V2V) communications.
- The NHTSA rulemaking will NOT require State and local DOTs to deploy V2I technology.
- However, the guidance and products/tools are useful resource to help those considering V2I deployment and to leverage developments via V2V communications.

Note: U.S. Department of Transportation Issues Advance Notice of Proposed Rulemaking to Begin Implementation of Vehicle-to-Vehicle Communications Technology (NHTSA 34-14 issued August 18, 2014); <http://www.nhtsa.gov/About+NHTSA/Press+Releases/NHTSA-issues-advanced-notice-of-proposed-rulemaking-on-V2V-communications>



Purpose of the Guidance Section

- This guidance is intended to assist Federal Highway Administration (FHWA) staff and transportation system owner/operators with deploying Vehicle to Infrastructure (V2I) technology.
- The guidance section is focused on the Federal-aid Highway program requirements as it relates to V2I deployments.
- Also, the guidance section is centered on ensuring interoperability with several standards as well as any standards that will be utilized in Vehicle to Vehicle (V2V) {e.g., DSRC}



Purpose of the Products/Tools Section

- The products/tools section is intended to support the guidance section with a number of best practices guides, cost analysis tools, and technology documents with an emphasis on V2I interoperability and effective planning/procurement/operations of the system.



Seeking Your Input

Download Material & Submit Comments

- The V2I Deployment Guidance Draft is an *initial* draft document.
- USDOT is seeking feedback from State and local Departments of Transportation, transit operators, other operating agencies, and infrastructure owners who are starting to plan for the deployment and use of connected vehicle technologies in their area.
- Comments through **Friday, November 14, 2014.**

http://www.its.dot.gov/meetings/v2i_feedback.htm



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