AASHTO "Connected Vehicle" Infrastructure Deployment Analysis

JPO Webinar
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Agenda

- Purpose of Deployment Plan
- Developmental Approach
- Task Highlights
- Scenarios 2011 – 2029
- Strategies 2011 – 2014+
- Companion Activities
- Next Steps

Plan Purpose

- Address Goals in 2009 Strategic Plan
  - Commitment to advance deployment readiness
  - Commitment to better understanding deployment Issues
- Identify a practical approach for infrastructure deployment
- Provide insights into what the future holds for applications, vehicles and communications
- Identify a phased deployment strategy with regional deployments
- Establish a foundation to conduct benefit assessments and business model development
- Provide insights on agency deployment and operations

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Plan Approach

- Set of building block tasks
    - 1) Applications Defined (the benefits)
    - 2) Market assessment of:
        - ❖ Vehicles trends
        - ❖ Communications infrastructure - what's available
        - ❖ After market devices - role and emergence
        - ❖ Consumer devices presence - impact on AASHTO community

Plan Approach

- 3) Survey of state activities in "connected vehicle space"
  - Actions demonstrate what is important
  - Provides possible locations for phased deployment
- 4) DSRC Assessment
  - What is current state of readiness
  - What are deployment issues

Plan Approach

- 5) Controller Assessment
  - Dimensions of upgrading nations controllers to DSRC operations
- 6) Deployment scenarios 2010 – 2035
- 7) Policy & Business Issues

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Applications

- **Intersection Safety**
  - Collaborated with FHWA – accident analysis
  - 2020 time frame for OEM equipped vehicles - based on NHTSA timeline
  - Value of early infrastructure for first vehicles
- **Agency Operations**
  - Traffic Control, including emergency vehicles
  - Commercial vehicle transactions
  - Fleets, Transit
- **Mobility**
  - Travel information ~ public package
  - Travel information ~ private package
  - In-vehicle signing

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Market assessment

- Embedded vehicle systems
  - Safety & Mobility ~ High potential ~ 200 million vehicles
  - Rollout curves
- After market vehicle systems
  - Primarily Mobility ~ unsure of market penetration?
    - ❖ New OnStar Offers
    - ❖ Ford Synch
    - ❖ New devices?
- Consumer electronics products ~ potentially big market?
  - Primarily mobility
  - smart phones ~ a lot
- Communications
  - Cellular
  - DSRC

Impacts of Distraction Issue unknown

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State Activities

- Emergency vehicles –AZ
- Intersection safety, mobility - CA
- Rural intersection safety, fuel taxes – MN
- Test beds, data management, infrastructure management – MI
- Commercial vehicles – NY
- Test bed ITSWC – FL
- Pooled fund study, SSOM Leadership – VA
- Rural corridors – ID
- Active traffic management - WA

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DSRC Assessment

- ## How will a national program be implemented and operated

  - Only 16 states currently hold licenses for the frequency, and not all of these are held by the transportation agency within the state.

  - there are over 100 companies that have license to the frequency   The majority of companies are telecoms or television stations.

  - each state gets 1 license for the entire state. A county license covers the county and so on.

  - A commercial company would get a license for installation anywhere in the country.

  - The FCC didn't see any problems as they feel individual licensees can address any interference issues between themselves and it also isn't a problem because the range is so limited

- ## DSRC is one of the more ambiguous elements

Controller Assessment

	Controller Type	Speed	Comm	OS	API	In Service
1	ATC 5.2b	Yes	Yes	Yes	Yes	8,000
2	Model 2070LX	Yes	Yes	Yes	Yes	0
3	Model 2070E	Yes	Yes	Yes	No	0
4	Model 2070L	Yes	Yes	Yes	No	52,000
5	NEMA, Modern	Yes	Yes	33%	No	36,000
6	NEMA, Legacy	No	Adaptor	Yes	No	91,000
7	Type 170, Modern	Yes	Yes	No	No	12,000
8	Type 170, Legacy	No	Adaptor	No	No	102,000
9	Electromechanical & Other	No	No	No	No	6,000
					Total:	307,000

Controller Assessment

Line	Controller Type	Upgrade Necessary for RSE
1	ATC 5.2b	None
2	Model 2070LX	None
3	Model 2070E	None
4	Model 2070L	None
5	NEMA TS-2 Ethernet (modern)	Standard OS (33%): None Non-Standard OS (67%): Port App, Cross-compile, Test
6	NEMA TS-1 (legacy)	Replace Controller
7	Type 170 controllers (modern)	Port App, Cross-compile, Test
8	Type 170 controllers (legacy)	Replace Controller
9	Electromechanical controllers	Replace Controller

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Controller Assessment

	Controller Type	Replaced	Cost EA	Cost Total
1	ATC 5.2b	0	$ 0	$ 0
2	Model 2070L	0	$ 0	$ 0

3	NEMA TS-2 Ethernet (modern)
	  Standard OS (33%)
	  Non-Standard OS (67%)
		
		0
		0
			
			$ 0
			$ 0
				$ 0
				$ 0

4	NEMA TS-1 (legacy shelf)	91,000	$ 1,350-$2350	$ 122,850,000-$213,850,000
5	Type 170 controllers (modern)	0	$ 0	$ 0
6	Type 170 controllers (legacy rack)	102,000	$ 2,200	$ 224,400,000
7	Electromechanical controllers	6,000	$ 900	$ 5,400,000
	The cost estimate presented in this table includes only the direct costs for controller upgrade and Additional costs could be significant!		**Totals:**	**$ 352,650,000-$443,650,000**

Scenarios 2011
Setting the Direction

- Define a "General Concept for Deployment"
  - No DSRC equipped vehicles until 2019
  - Support applications on aftermarket & consumer devices
  - Deploy RSE for selected applications and users
    - ❖ Mobility & agency operations
    - ❖ Commercial vehicle transactions
    - ❖ Emergency Vehicle pre-emption
    - ❖ Safety applications at isolated intersections
  - Establish specific applications & desired outcomes
  - Begin broadening coverage and use of RSE's
  - Share results with AASHTO community & others

14

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Scenarios 2012 Showing Success

- Individual agency programs advancing
  - Michigan – probe data from a controlled fleet of test vehicles
  - California – major corridor demonstrating "green wave" in Palo Alto
  - Minnesota – gathering User Fee data from public volunteers
  - I-95 Coalition – demonstrating aftermarket device for road side inspection
  - Florida – ITSWC Demonstrations

- USDOT Safety Pilot

Scenarios 2012 Showing Success

- Develop a "National DSRC Footprint Analysis"
  - Provide more specific direction for RSE infrastructure
  - Corridors Defined
  - Intersections selected for safety
  - Analysis of denser urban RSE pockets
    - ❖ Signal control
    - ❖ safety
  - Certificate management requirements

Scenarios 2013 – 2014 Jumpstarting Deployment

- USDOT
  - NHTSA Agency decision
  - Safety Pilot results
  - Practioner's Toolbox
- AASHTO
  - Definitive plan for infrastructure
  - Policy and Funding statements
  - Peer Deplorers' Forum
  - Best practices workshops
- VIIC & OEM's
  - Closer AASHTO collaboration

2015 – 2019
Expanding the Field

- Light vehicles equipped with DSRC start to appear ~ 7% of fleet

- AASHTO begins to shift from commercial and agency emphasis to light vehicle emphasis for RES deployments

- Now RSE foot print shifts to a nation wide network

- Agency selected applications advancing

Scenarios 2020 – 2023 Taking Solutions to Market

- Model year zero for DSRC Vehicle Introduction
  - ❖ In four years 30% of vehicles equipped with DSRC safety
- Begin RSE expansion to prepare for early embedded vehicles
  - ❖ VIIC analysis – 5000 RSE initial for certificate management
  - ❖ High priority intersections, safety zones, commercial and emergency vehicle sites
- Applications supporting agency operations maturing
- AASHTO "Green Book" Design Guidelines used to guide installations and operations
- AASHTO Application store for agency applications?

Scenarios 2020 – 2023
Taking the Solutions to Market

- Widespread 4G (& newly available 5G) services increasingly widespread along with a large national DSRC infrastructure

- Variety of connected vehicle applications available through the public and private sector resulting in improved safety and agency operations

Scenarios 2024 – 2029 Growing to Meet Demand

- Vehicle fleet equipped with DSRC grows from 30% - 70%

- V2V & V2I benefits becoming apparent to all

- Agencies operating a large national infrastructure of DSRC communications

- DSRC infrastructure explicit part of design, construction, operations

- Applications fully integrated into agency operations

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AASHTO Strategies 2011

- Information Exchange Program
    - Semi annual workshops through SSOM
    - Technical briefings – papers, web calls
- Advice Memorandums to USDOT
- Procurement Guidance phase 1
    - USDOT qualified product list
- Formal education & outreach program
- Establish Joint planning committee for national DSRC footprint

AASHTO Strategies 2012

- Broaden awareness through education & outreach program

- Joint AASHTO/VIIC Committee publishes national DSRC footprint requirements to prepare for initial deployments

- AASHTO policy on minimum infrastructure deployment levels by all members

- AASHTO develops formal "Connected Vehicle" Infrastructure Design Guides

AASHTO Strategies 2013 - 2014

- Adopt policy for minimum levels of deployments in each state

- To ensure above can be achieved AASHTO adopts a national funding approach

- Creation of a Deployment Support program
  - Peer Deployer's program
  - Formal Association relationship for deployment
    - ❖ USDOT, VIIC, NACo, Etc

AASHTO Strategies Beyond 2014

- Prepare for national build out
  - Reasonable to assume that the NHTSA agency decision will be combined with a national infrastructure decision?
- Update design guides
- Policies on public – private investments for capital and operations

Companion Activities

- Pooled Fund
  - States – traffic ctrl, pavement assessment, SPaT
  - DMA – FHWA; 1) SE, 2) Field test for traffic management & control
  - Certification HW/SW
  - OBE Aftermarket Device
- JPO Activities
  - Safety Pilot - learn
  - Regional pilots ~ 2014
- NCHRP G03 – (101) Benefit Assessment & DSRC
- VIIC Discussions & Collaboration

Next Steps

- AASHTO WG Meeting
  - Report discussion
  - Start on General Concept for Deployment
  - Establish commitments
- Brief AASHTO/NACo committees
- AASHTO Annual meeting Session
- Executive Leadership Team briefing