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Oregon ITE ITS Subcommittee
February 13, 2013

Reflections on 20 Years of the U.S. National ITS Program

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ite OREGON SECTION





Secretary LaHood's Priorities

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Safety: Improve public health and safety by reducing transportation-related fatalities and injuries.

State of Good Repair: Ensure the U.S. proactively maintains its critical transportation infrastructure in a state of good repair.

Economic Competitiveness: Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens

Livable Communities: Foster livable communities through place-based policies and investments that increase transportation choices and access to transportation services

Environmental Sustainability: Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources

U.S. Transport Sector Impacts

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Safety

- 32,788 fatalities in 2010 (-3% from 2009)
- 1.09 fatalities per 100 million vehicle miles traveled (0.7% increase in VMT in 2010)
- 2.2 million injuries in 2009
- 5.5 million crashes in 2009
- $230 billion total cost
  - $32 billion medical cost
  - $51 billion for impaired driving
- Leading cause of death for ages 4 to 34

Accessibility, Reliability and Mobility

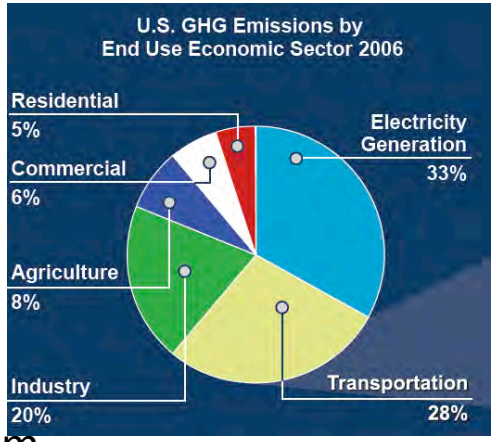
- 4.8 billion hours of travel delay (34 hours per auto commuter)
- $115 billion cost of urban congestion

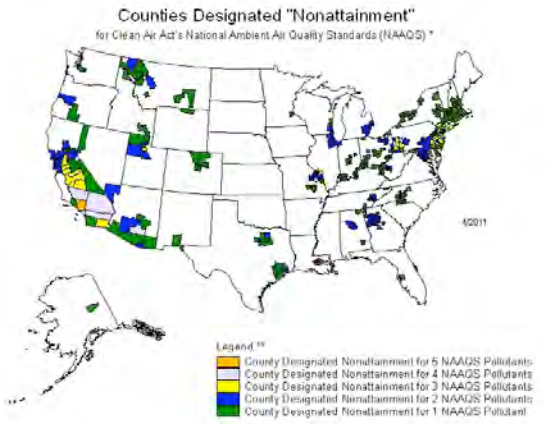
Household Market Basket

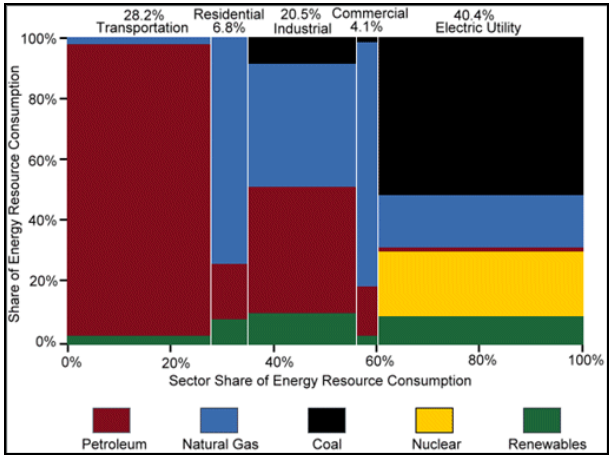
- Second biggest monthly expense, after housing

U.S. Transport Impact on Environment

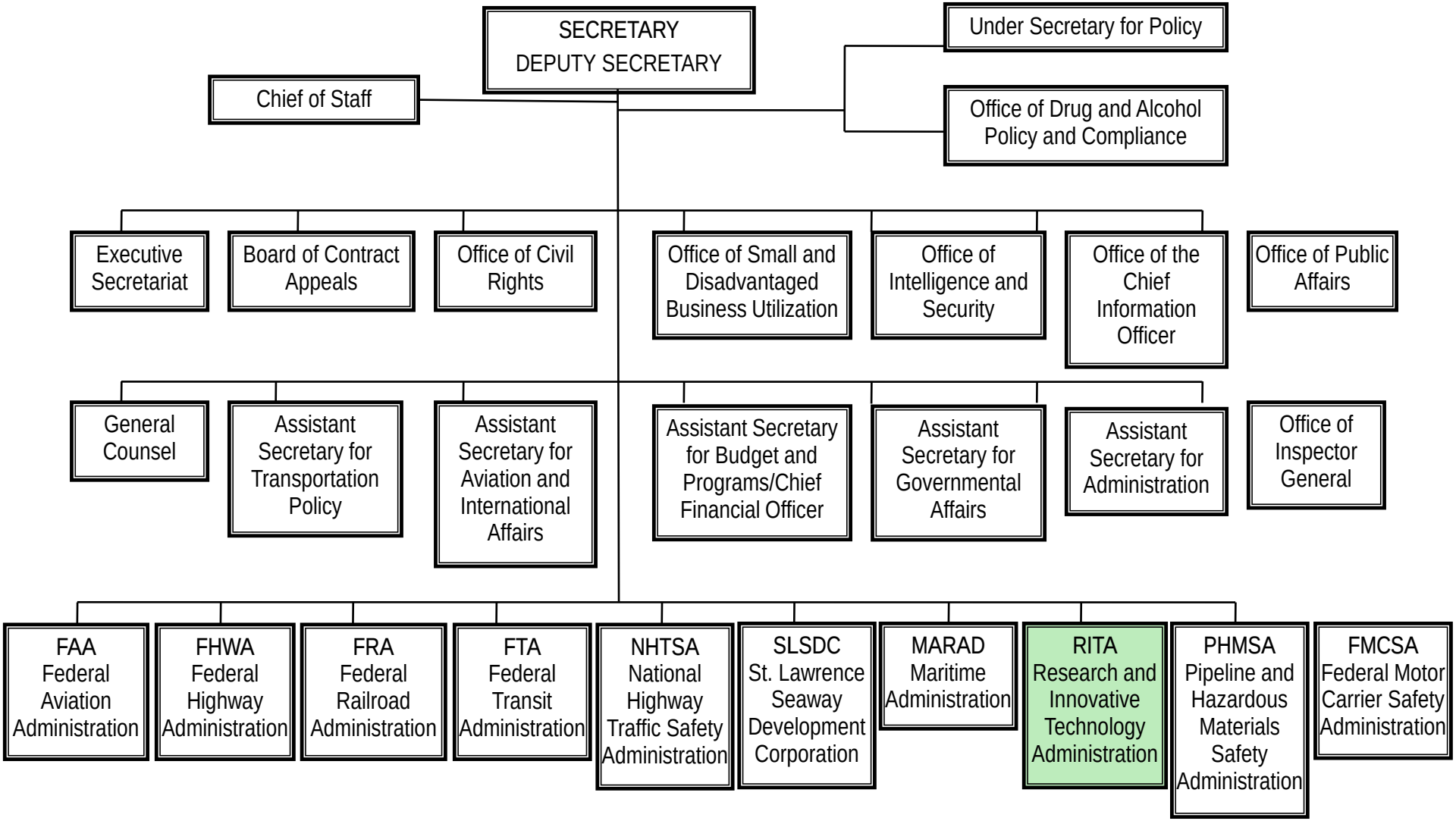
- 28% of U.S. GHG emissions
  - 78% of CO
  - 58% of NO_x
  - 36% of VOCs
- Contributions to particulate matter
- 29% of U.S. energy
- consumption, almost all petroleum
- 70% of U.S. petroleum consumption
  - 60% of oil imported → 68% in 2020
  - >40% of imported oil from OPEC nations
- 3.9 billion gallons of wasted fuel annually
- About half of all Americans live in areas that exceed air quality standards for at least one pollutant
- No national GHG standards but many state and local







U.S. DOT is the Sum of its Modes—Including RITA



RITA Organization

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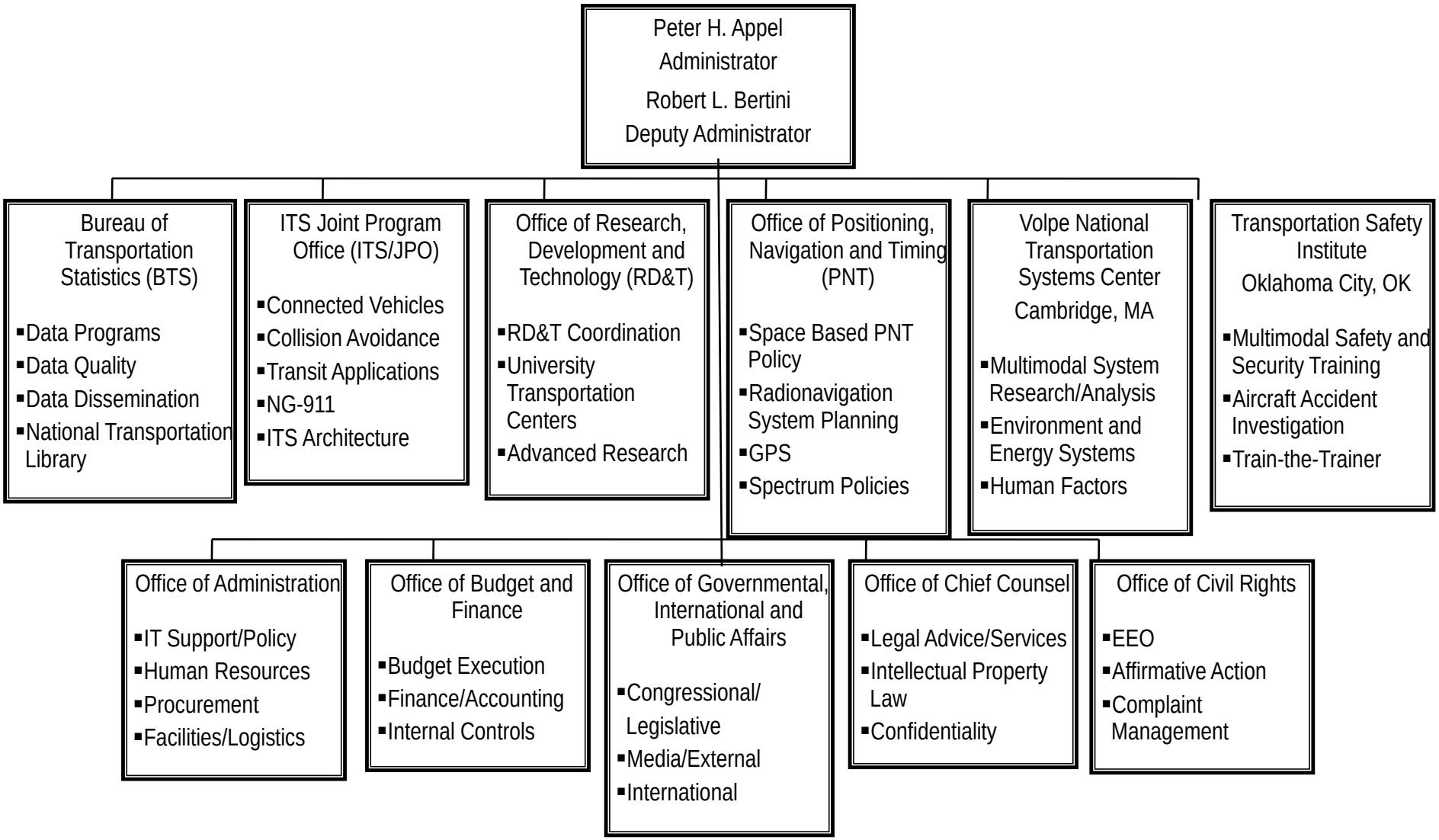
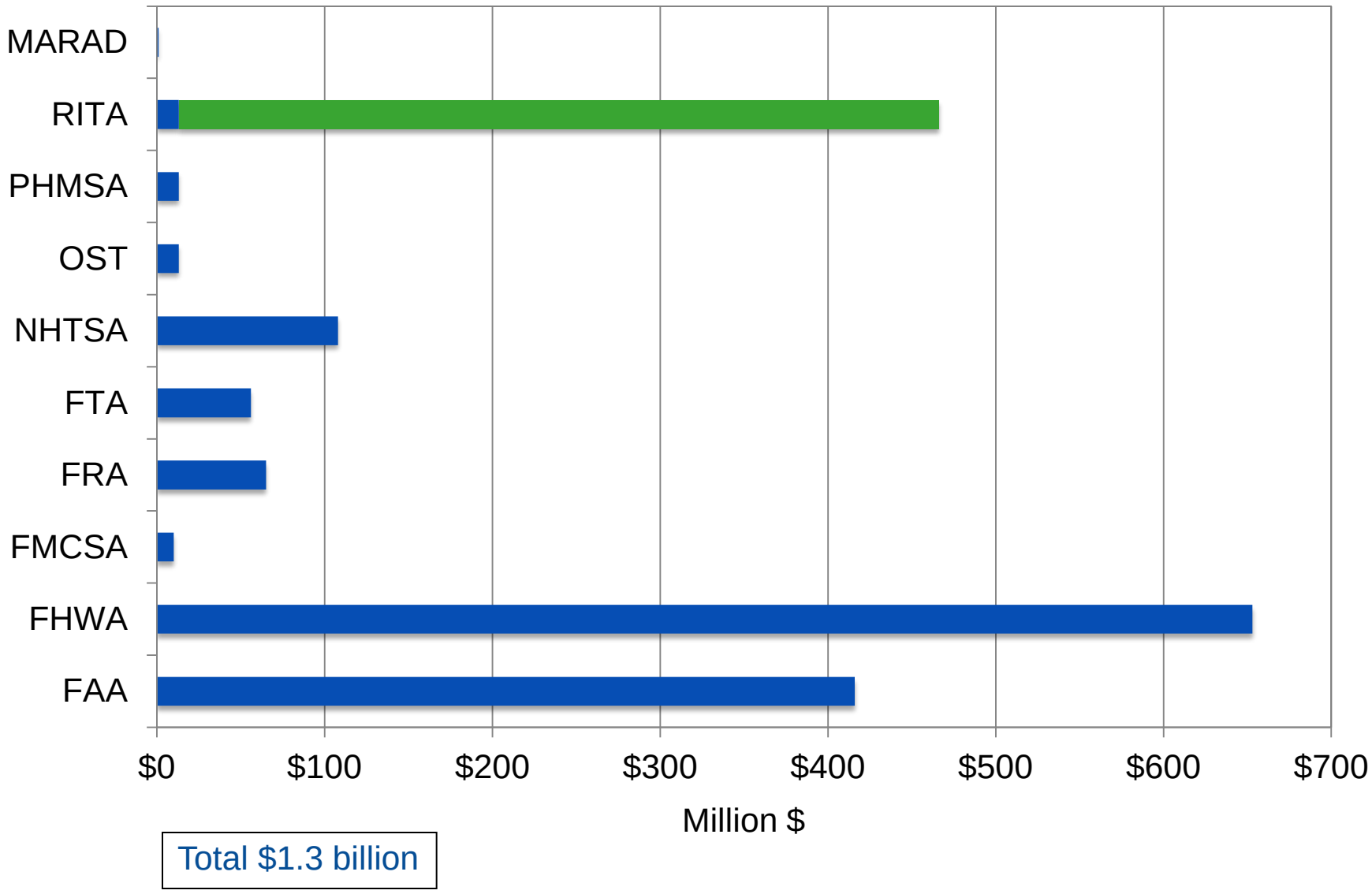


Estimated FY 10 DOT Research Budget



Total $1.3 billion

USDOT Budget and Personnel

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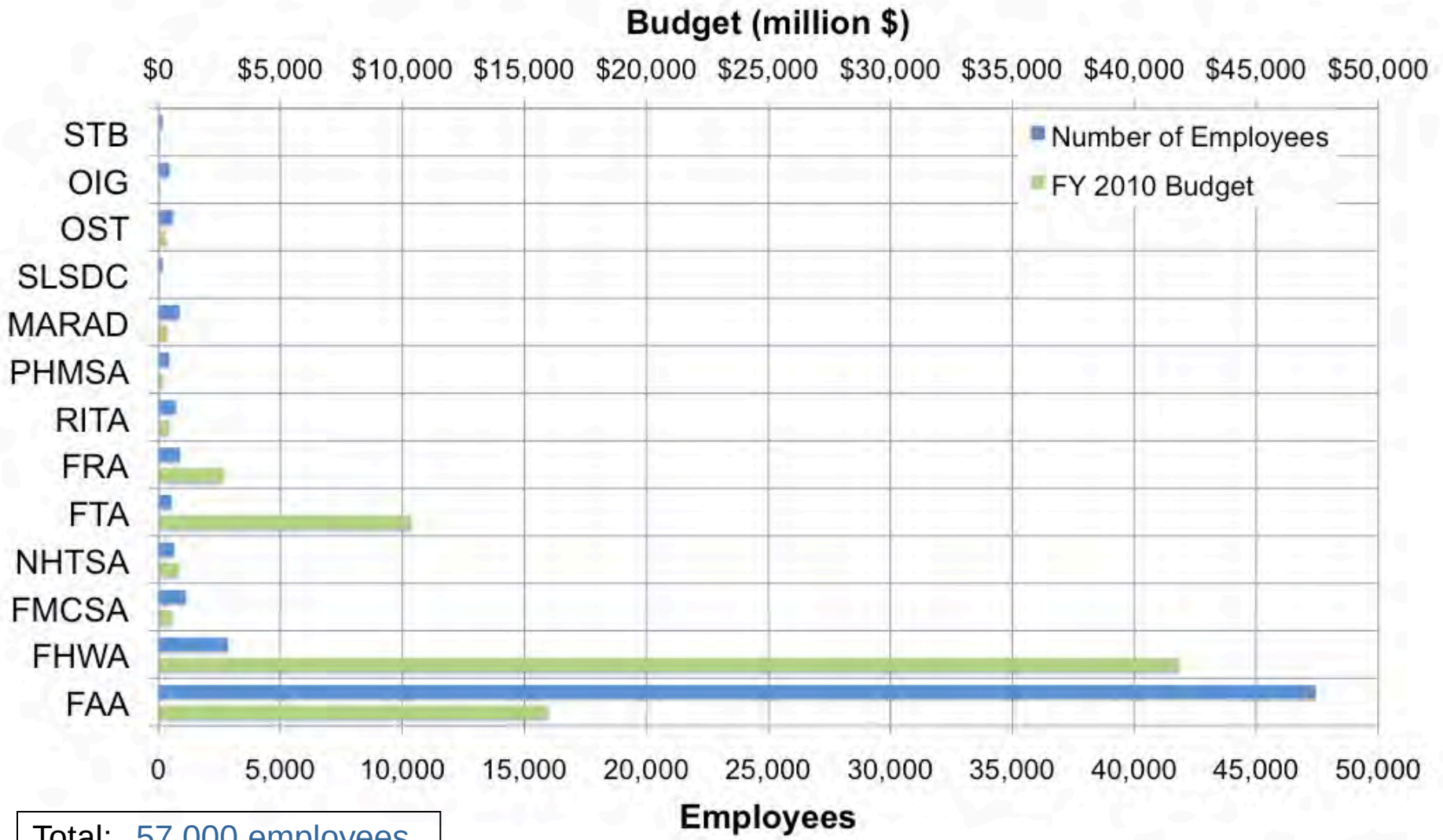

Total: 57,000 employees
$73 Billion

ITS Joint Program Office

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- More cross modal
- Now including rail and maritime
- Cars, trucks, buses, fleets, and vehicles of all kinds
- Commitment to dedicated short range communications
  - Safety
  - Mobility
  - Environment
- Increased outreach and involvement of stakeholders
- Broadening of participation of public and private sectors and universities

ITS By the Numbers

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Years:	**20**+
Funding:	$**3**B federal + $**18**B by **75** top metro areas
Market:	$**48**B ITS end-use products and servivces
Federal Programs:	**3** (ISTEA, TEA21, SAFETEA-LU)
Electronic Toll Collection:	**99**% of plazas/**94**% of lanes
Transit Automatic Vehicle Location:	**77**% of **117** fixed route bus agencies
Transit Smart Cards:	**16,00**0+ buses/**451** rail stations
Commercial Vehicle Electronic Screening:	**40** states/**360** weigh stations/**70,000** companies/**500,000** trucks
Professional Capacity Building:	**2,500** participants in 2010
Standards Participation:	**106** published since 1995
Traffic Management Centers:	**266**
Freeway Miles Under Surveillance:	**7,70**0 roadside/**4,500** probe vehicles/**54**% of freeways in **75** metropolitan areas
Arterial Miles Under Surveillance:	**2,500** roadside/**1,700** probe vehicles/**50**% of intersections in **75** metropolitan areas
511 Coverage:	All or part of **38** states (**70**% of population)
Dynamic Message Signs:	**4,200**/**109** freeway management agencies post information/**36** of **40** metro areas post travel times

Deployed Technologies

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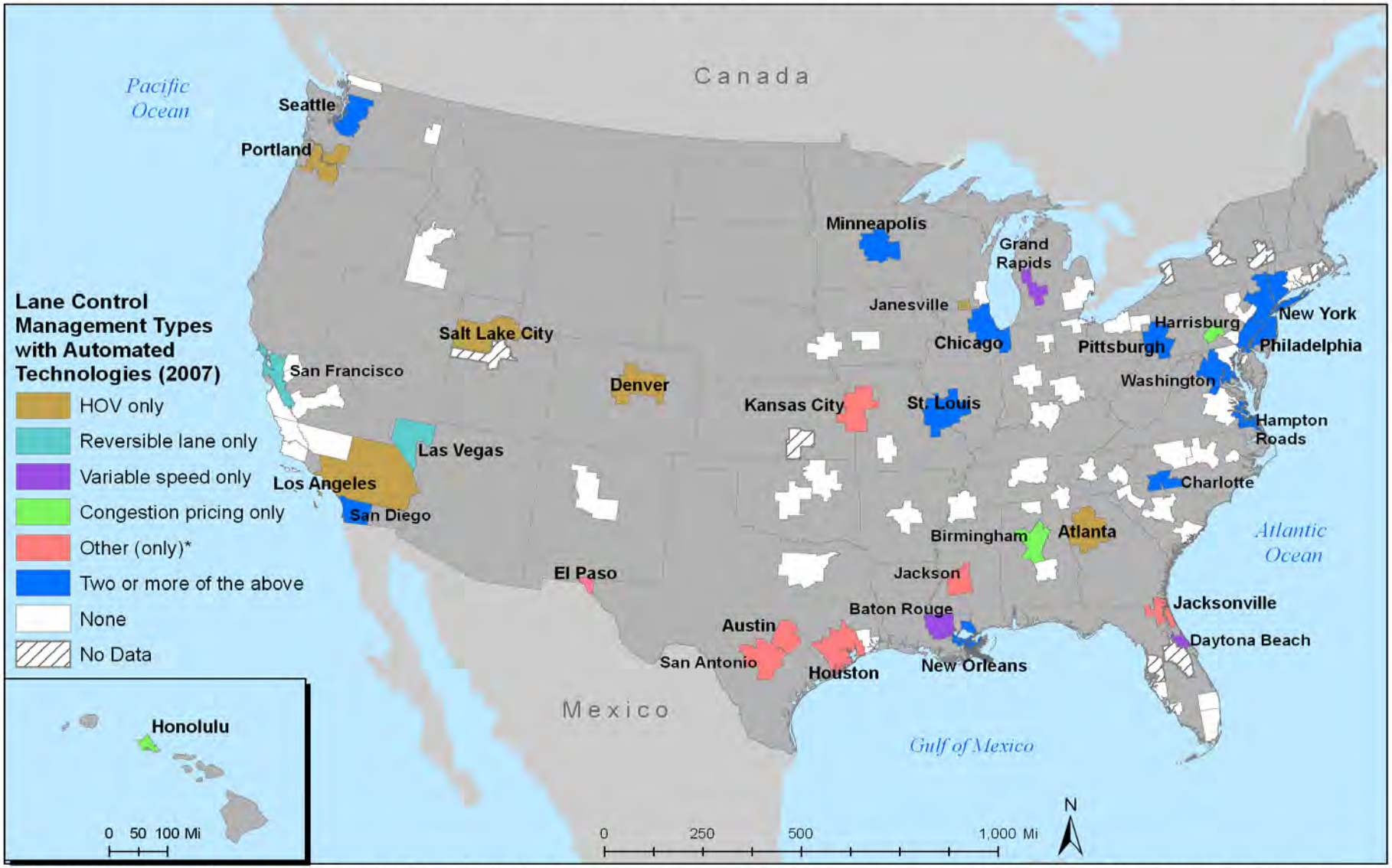
- CCTV Cameras
- Traveler Information
  - DMS ~90% of freeways
  - Social Networking 40%
  - HAR 60%
  - Subscription 35%
  - Web 90%
  - Email 50%
  - Phone 20%
  - 511 70%
- Electronic Toll Collection
- Ramp Control
- Sensors/Loops
- Automated Enforcement
- Lane Management
- Archived Data
- Probe Vehicles

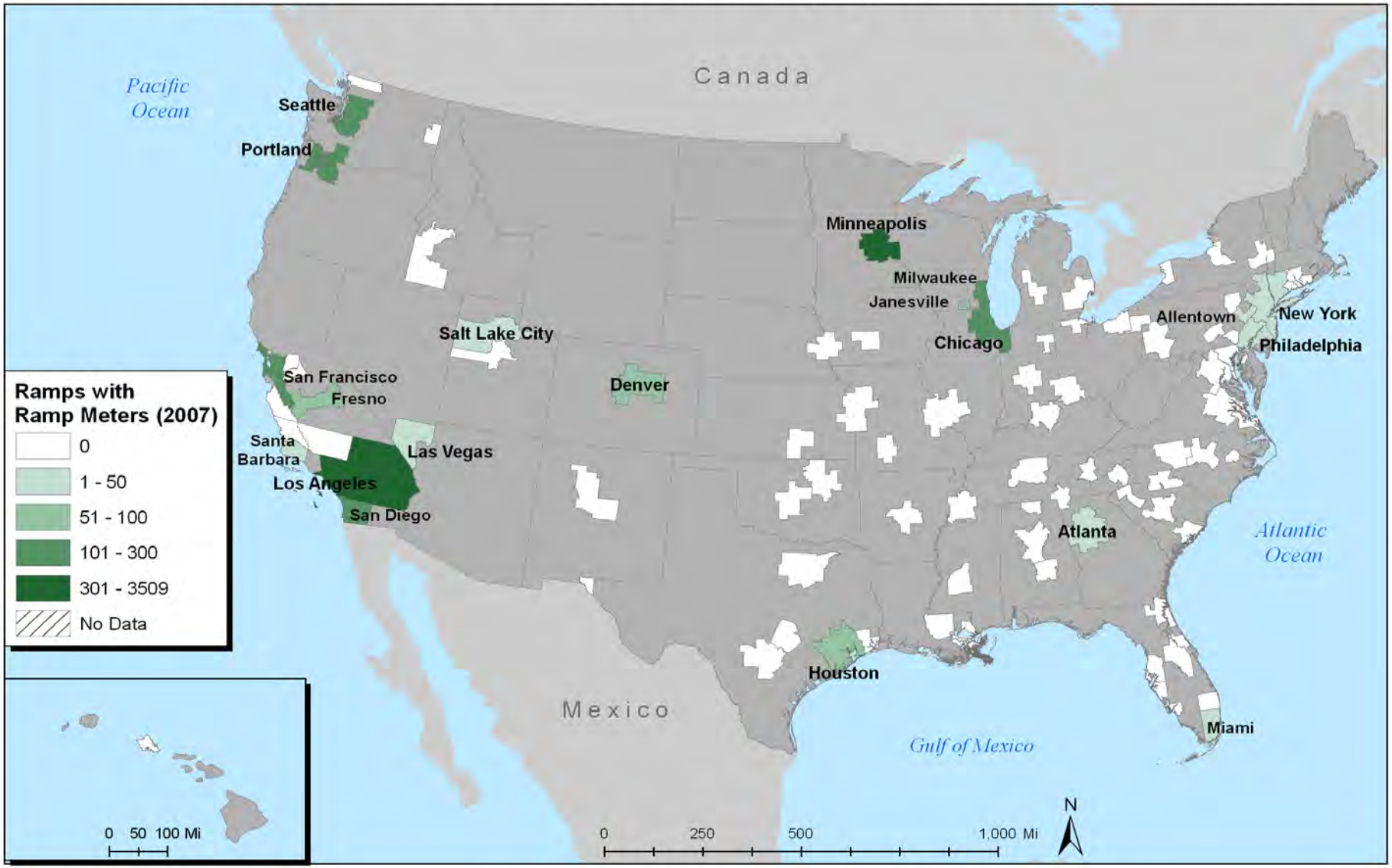
Metropolitan Areas with Agencies Employing Automated Lane Control Technologies



* *Other (only)* indicates the presence of freeway lanes equipped with: (a) lane management measures such as reversible flow lanes and lane control management to support emergency evacutions or (b) lane control signs, supported by surveillance and detection technologies, to allow the temporary closure of lanes.

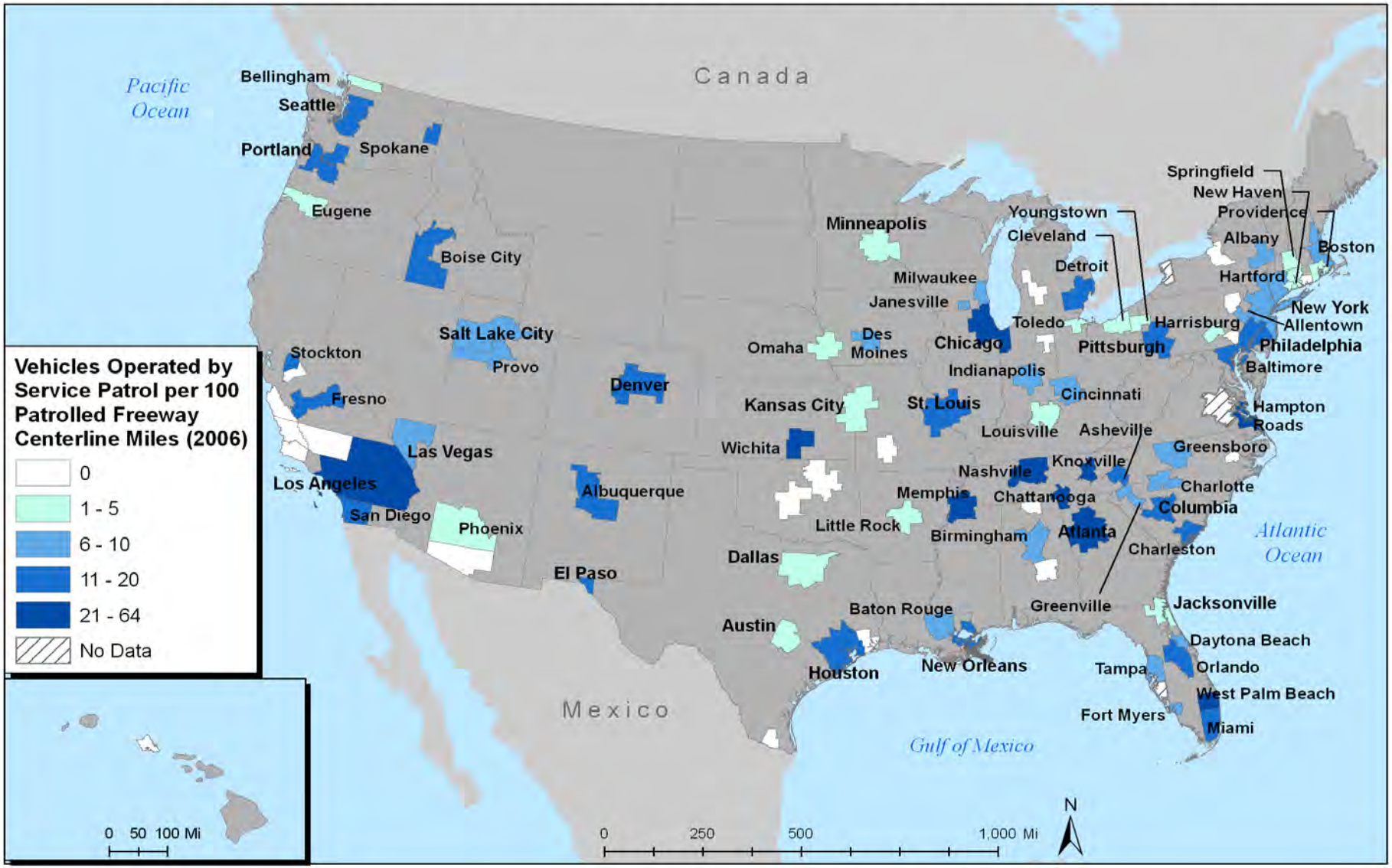
Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

Freeway Ramps with Ramp Meters Operated by Agencies in Metropolitan Areas



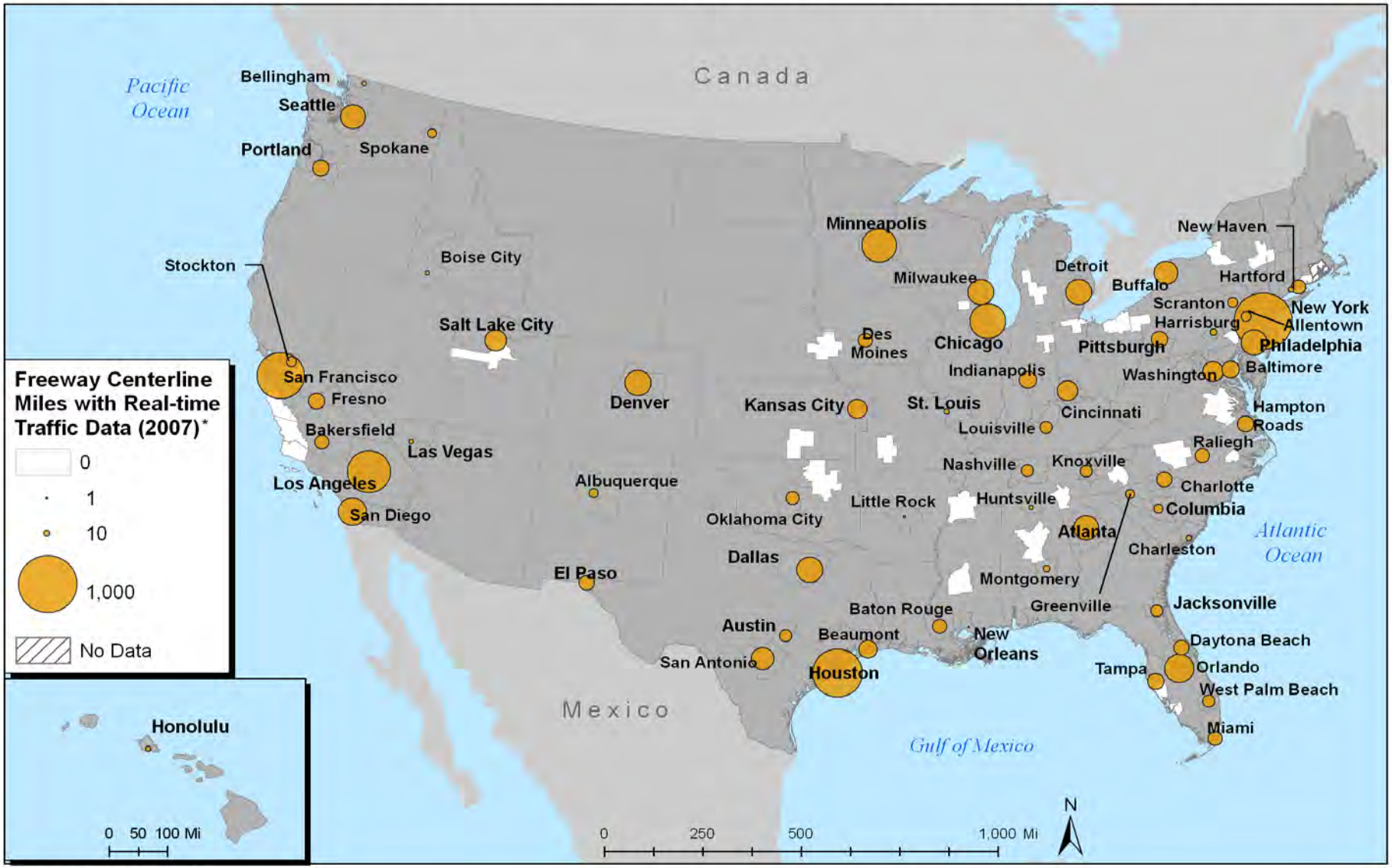
Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

Service Patrols per 100 Freeway Centerline Miles by Metropolitan Area



Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

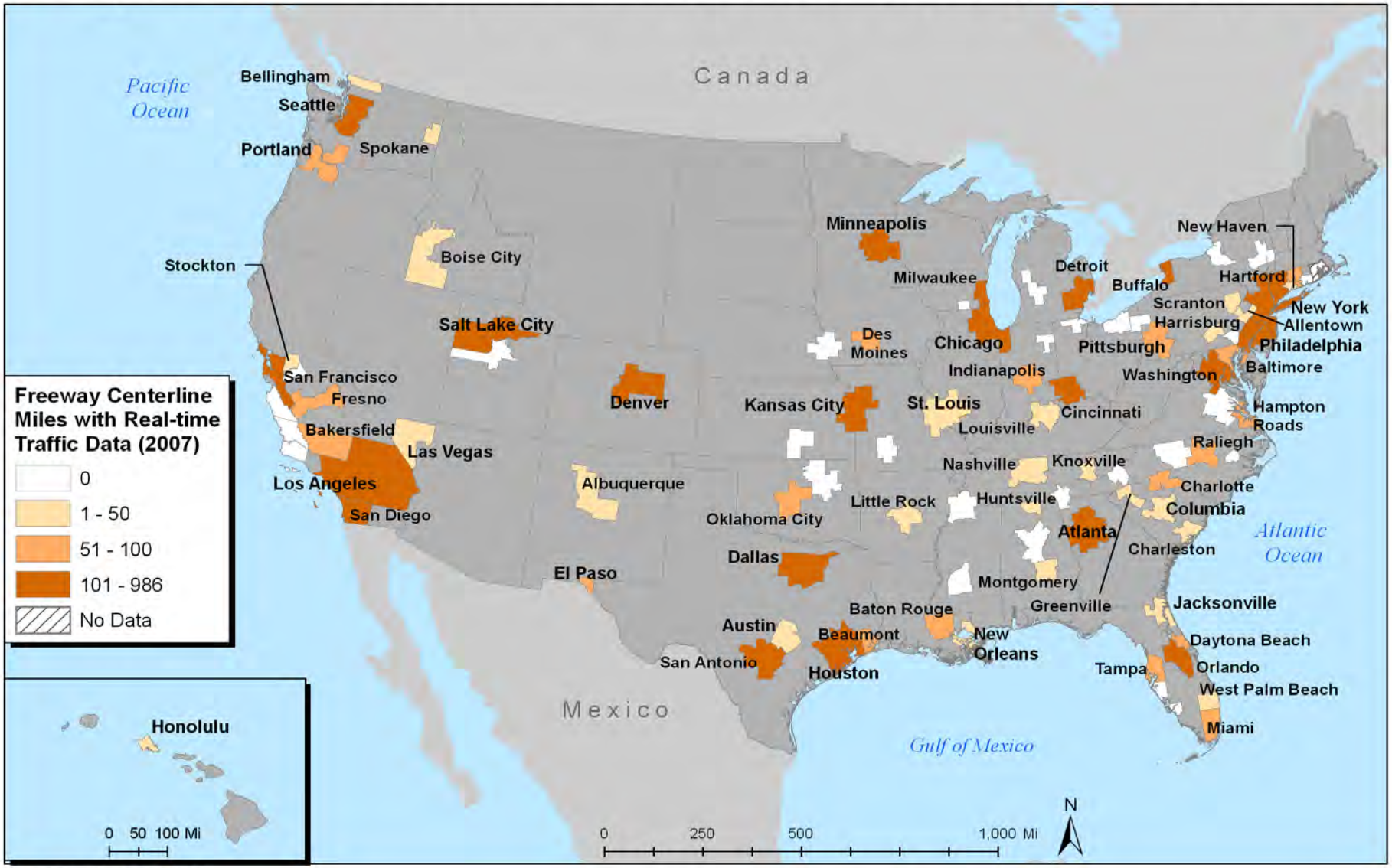
Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area



* Does not include CCTV

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area



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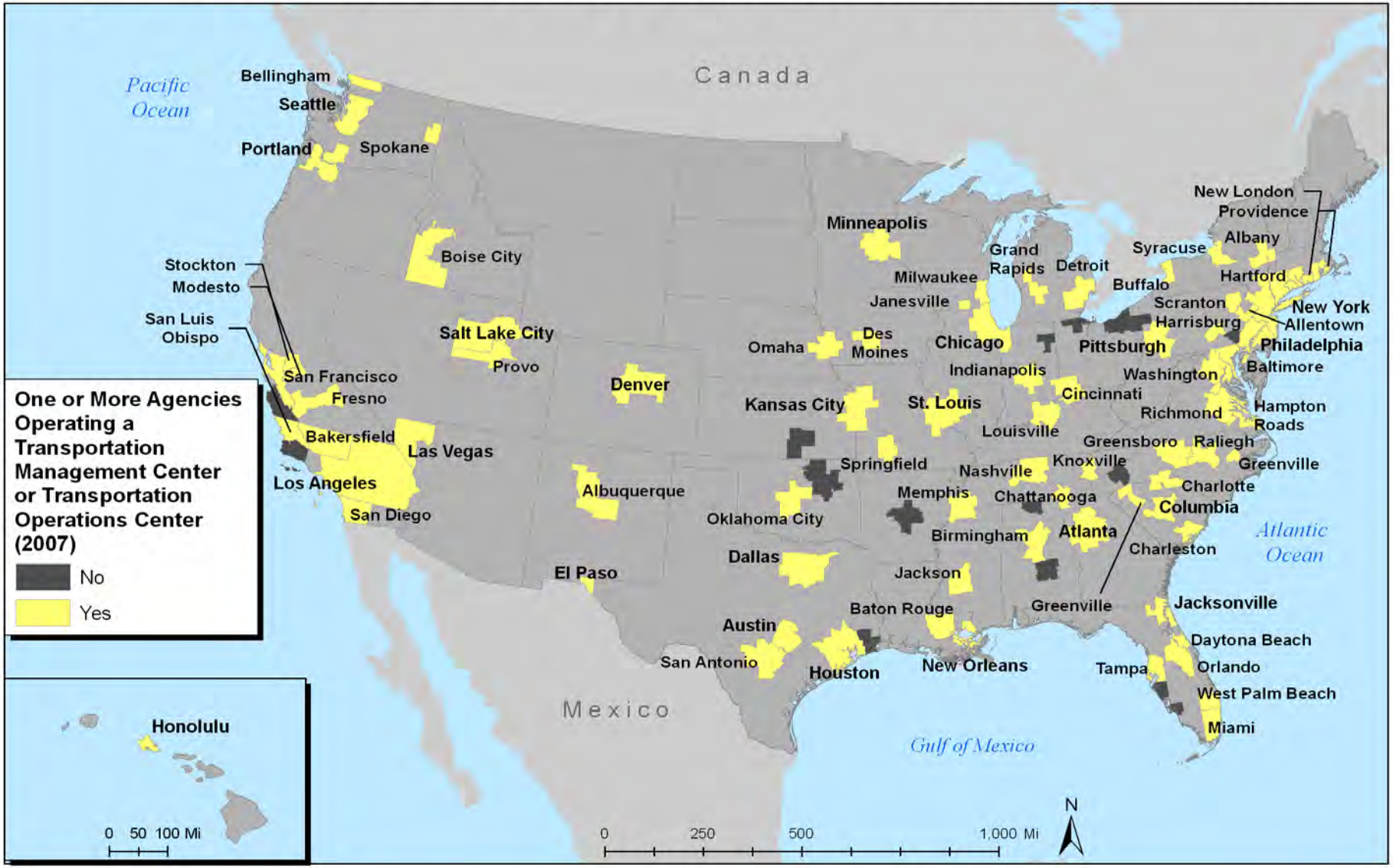
Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

Metropolitan Areas with a Transportation Management or Transportation Operations Center



Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

ITS Benefits and Costs

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- ITS Benefits Database
  - 566 benefit element
  - 362 source documents
- ITS Costs Database
  - 291 cost elements
  - 194 system cost summaries
  - 171 source documents
- Deployment statistics continually tracked in 108 metro areas

Survey Type	Sent	Returned	Response Rate
Arterial Management	542	433	80%
Electronic Toll Collection	74	71	96%
Freeway Management	148	124	84%
Public Safety - Fire Rescue	386	313	81%
Public Safety - Law Enforcement	530	450	85%
Transit Management	235	206	88%
Total	1915	1597	83%

Top 10 Benefits

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Title	Goals
Virginia 511 services indicated 90 percent of callers found the service useful, and nearly half adjusted their travel plans based on the information provided.	Customer Satisfaction
Freeway lane reversal improved traffic volumes by 44 percent following South Carolina hurricane	Efficiency
By implementing coordinated signal timing on the arterial network in Syracuse, New York total fuel consumption was reduced by 9 to 13 percent, average fuel consumption declined by 7 to 14 percent, average vehicle emissions decreased by 9 to 13 percent.	Energy & Environment
The E-ZPass electronic toll collection system on New Jersey Turnpike reduced delay for all vehicles by 85% saving approximately 2.1 million hrs per year, an estimated 1.2 million gallons of fuel each year and eliminating approximately 0.35 tons of VOC and 0.056 tons NOx per weekday.	Energy & Environment Mobility
Bus rapid transit (BRT) can reduce transit running times by 38 to 69 percent, increase ridership by 35 to 77 percent, and improve service reliability.	Mobility
In Washington DC an ITS work zone program implemented on I-295 decreased delay up to 90 percent with an average decrease in delay of 52 percent when drivers were advised to take alternate routes.	Mobility
In Oakland County, Michigan a two-phase project to retime 640 traffic signals resulted in a benefit-cost ratio of 175:1 for the first phase and 55:1 for the second.	Productivity
The Traffic Light Synchronization program in Texas demonstrated a benefit-to-cost ratio of 62:1	Productivity
Integrated Corridor Management (ICM) strategies that promote integration among freeways, arterials, and transit systems can help balance traffic flow and enhance corridor performance; simulation models indicate benefit-to-cost ratios for combined strategies range from 7:1 to 25:1.	Productivity
An anti-icing program implemented by the Idaho Transportation Department resulted in a 83 percent decline in winter crash frequency.	Safety

Top 10 Safety Benefits

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Title
Advanced curve warning system on interstate in northern California caused over 68% of drivers to reduce their speed.
An evaluation of infrared brake screening systems at weigh stations indicated the technology increased the percentage of vehicles placed out of service because of brake problems by 250 percent.
In Vantage, Washington, the deployment of an automated anti-icing system on I-90 was projected to eliminate up to 80 percent of snow and ice related crashes.
Anti-icing program implemented by Idaho Transportation Department resulted in a 83% decline in winter crash frequency.
Automatic anti-icing systems on bridges reduced crashes by 25-100% and benefit-to-cost ratios ranged from 1.8:1-3.4:1.
Based on all police-reported crashes in 7 states over 2 years, electronic stability control (ESC) reduced single-vehicle crash involvement risk by approximately 41 percent and single-vehicle injury crash involvement risk by 41 percent.
In Switzerland, an animal warning system installed at 7 sites decreased collisions with large animals by more than 80 percent.
In Georgia, the Navigator incident management program reduced secondary crashes from an expected 676 to 210 in the twelve months ending April 2004.
In Myrtle Creek, Oregon, advanced curve speed warning system installed on I-5 reduced speed of 76% of drivers surveyed.
Through use of the Roll Stability Control (RSC) systems, it was estimated that between 1,422 and 2,037 combination vehicle rollover crashes in curves could be prevented, resulting in effectiveness rates of 37 percent and 53 percent, respectively.

Evolution of U.S. ITS Program

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Congressional Legislation	Dates and Mission
Intermodal Surface Transportation Efficiency Act (**ISTEA**)	1991–1997 (extended to July 1998) ▪ Research and Development ▪ Operational Tests ▪ Technical assistance including architecture and standards
Transportation Equity Act for the 21st Century (**TEA-21**)	1998–2003 (extended to August 2005) ▪ Policy and Institutional Challenges to Deployment ▪ ITS Deployment Program (Congressionally designated) ▪ Model Deployment Initiatives
Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (**SAFETEA-LU**)	2005–2009 (extended to March 31, 2012) ▪ Research ▪ Mainstreaming ITS
Moving Ahead for Progress in the 21st Century (**MAP-21)**	2012-2014

Crash Avoidance Has Arrived

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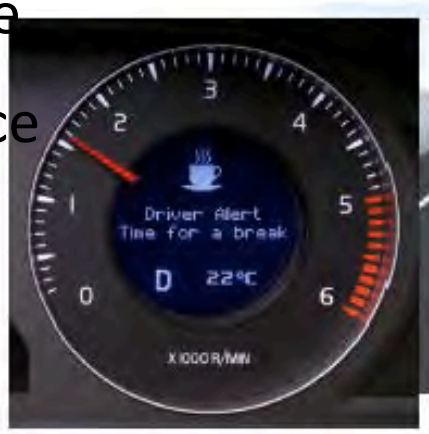
- Electronic Stability Control
- Adaptive Cruise Control
- Forward collision warning/avoidance
- Lane departure warning/ avoidance
- Blind spot warning/ avoidance
- Pedestrian warning/ avoidance
- Driver Alert (fatigue)
- Night Vision
- Speed Sign Recognition



Today's Intelligent Vehicles

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Available in a $20,000 car

(Ford Focus):

- Adaptive cruise control
- Forward Collision Mitigation
- Blind spot information system
- Traffic sign recognition
- Lane keeping aid
- Driver alert

Vision for Connected Future

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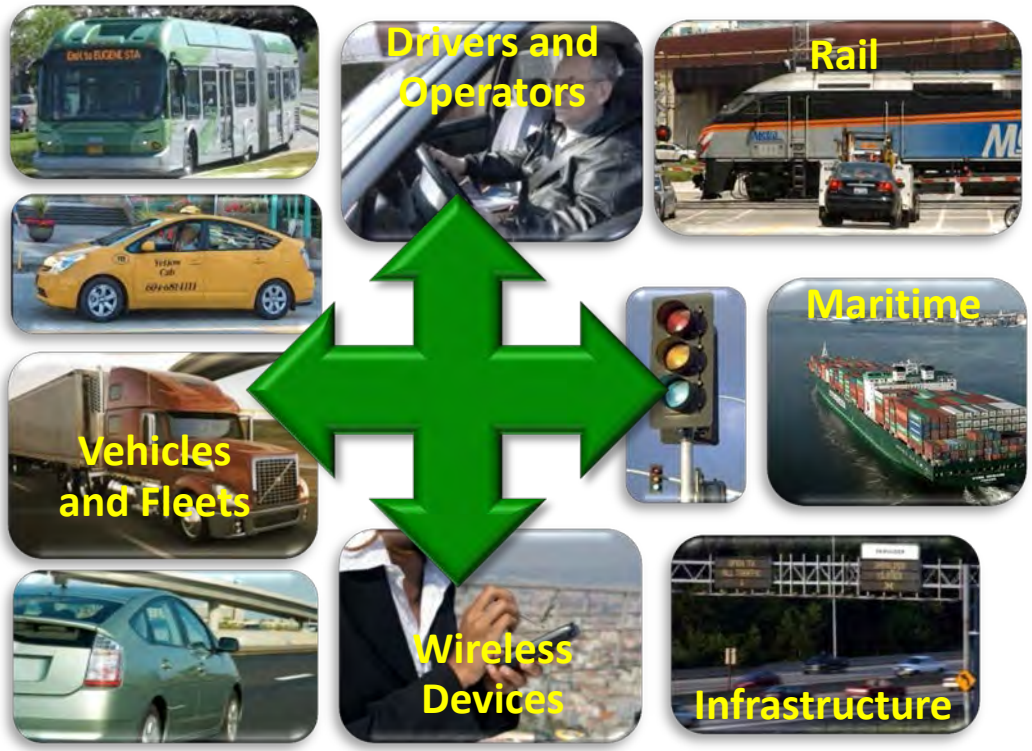
- Multi-modal surface transportation system—with connectivity as its central core.
- Vehicles (cars, trucks, buses, fleets of all kinds) ←→ Drivers and operators ←→ Infrastructure ←→ Mobile Devices
- Leveraging technology to maximize safety, mobility and the environment—enabled through wireless communications—in all modes.
- First priority is safety: crash and injury prevention (address 80% of crash scenarios).



Strategic Research Plan

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The Evolution of ITS

Traditional ITS Technologies


Ramp Metering

Transit Information


CV Electronic Credentialing


Transportation Management Centers

Major ITS Initiatives


ICM


IVBSS


VII - POC


MSAA

NG911

Research


Drivers


Vehicles


Infrastructure


Wireless Devices

Wireless Connectivity

Deployment

Demonstration/Deployment

ITS Strategic Research

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Vision: National, multi-modal surface transportation system that features a connected transportation environment among vehicles (cars, trucks, buses, fleets of all kinds), the infrastructure, and mobile devices to serve the public good by leveraging technology to maximize safety, mobility and environmental performance. Connectivity is achieved through dedicated short range communications (DSRC).

Goal: Safety

Vehicle to Vehicle Communications for Safety

Vehicle to Infrastructure Communications for Safety

Goal: Mobility / Accessibility / Reliability

Real-Time Data Capture and Management

Dynamic Mobility Applications including Weather

Goal: Environment

Applications for the Environment: Real-Time Information Synthesis (AERIS)

Real-time, environmental data from all sources will be integrated and available for use in multimodal transportation management and performance improvement and will contribute to better environmental practices.

ITS Strategic Research Program Components

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Applications

Safety			Mobility		Environment	
V2V	V2I	Safety Pilot	Real Time Data Capture & Management	Dynamic Mobility Applications	AERIS	Road Weather Applications

Technology

- Harmonization of International Standards & Architecture
- Human Factors
- Systems Engineering
- Certification
- Test Environments

Policy

- Deployment Scenarios
- Financing & Investment Models
- Operations & Governance
- Institutional Issues

A World With Connected Vehicles & Travelers

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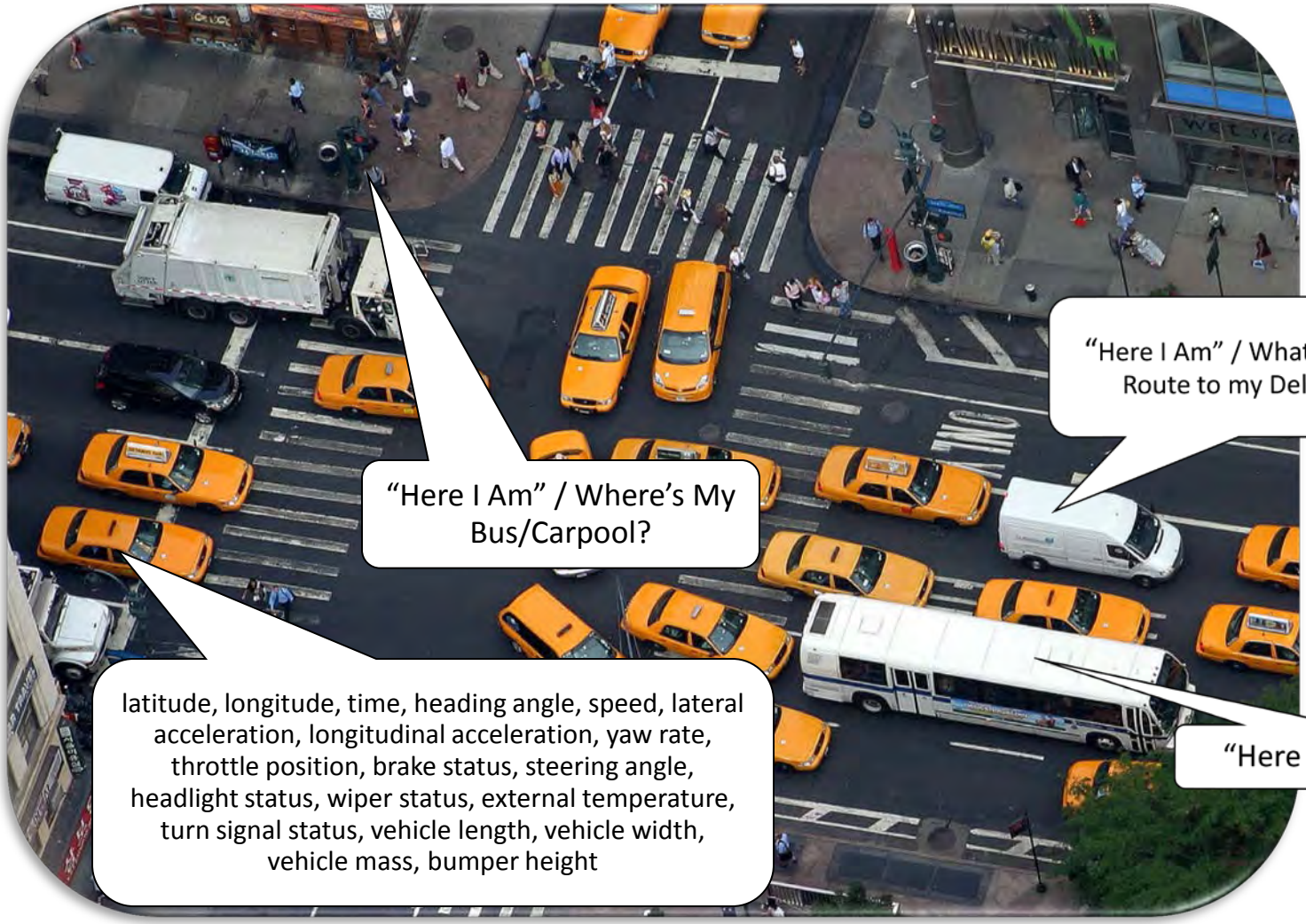

Connectivity

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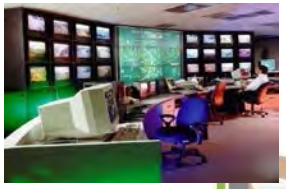

Opportunity for Innovation

Vehicle Status Data

...65 mph...
....brakes on....
....two passengers....

Infrastructure Status Data

E-Payment Service

Real-Time Travel Info

Data Environment

Weather Data

Signal Phase & Timing Adjusts Real-Time Conditions

Transaction Data

Location Data

Safety Alerts and Warnings

Data is Power

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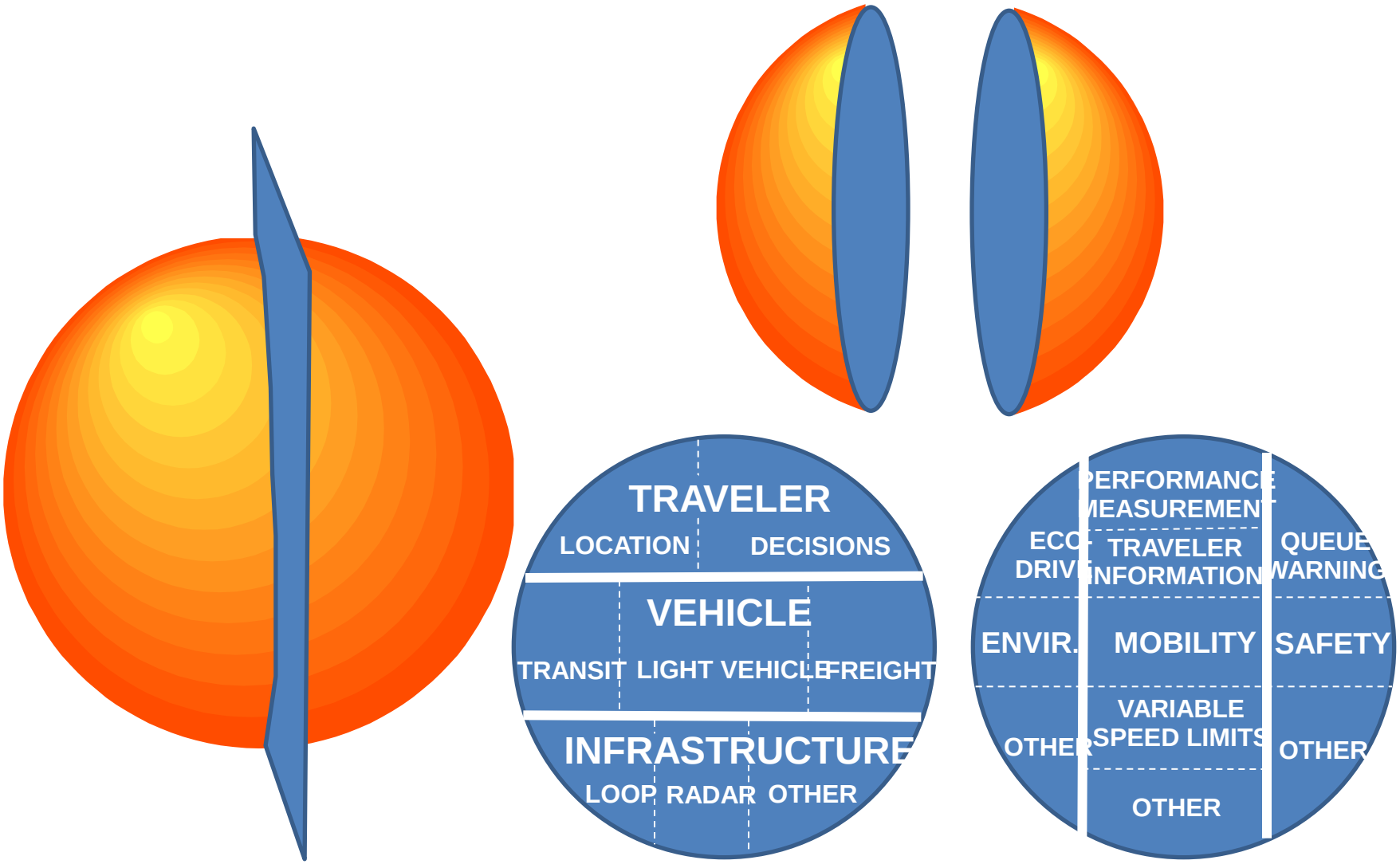

Data Environment Evolution

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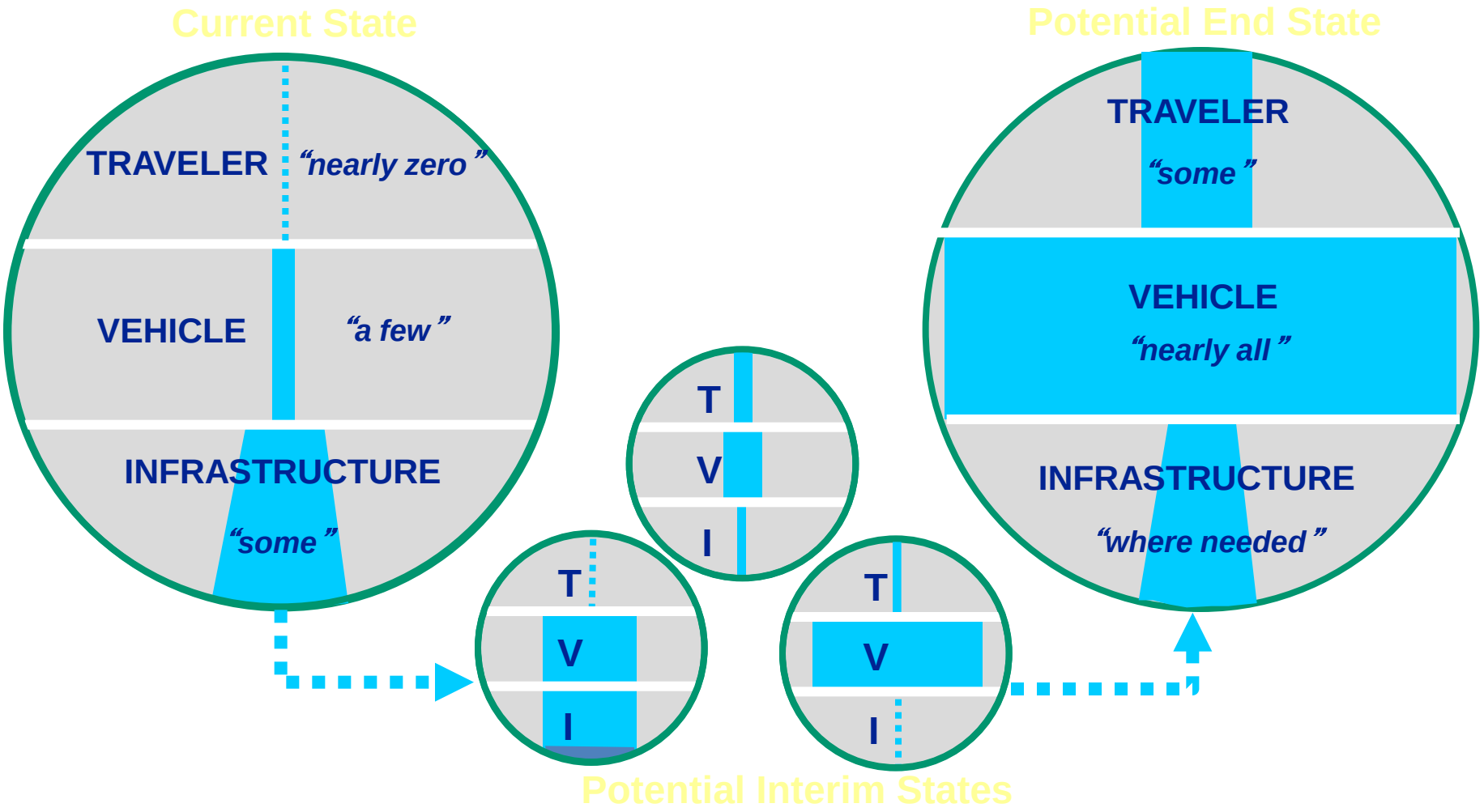

Safety Pilot 2011-2013

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- Major field test and real world implementation
  - Multiple vehicle types: cars, fleets, trucks, buses
  - Fully integrated systems & aftermarket devices
  - Prototype security mechanisms
  - Certification processes
- Goals
  - Support real world V2V & V2I applications with data rich environment
  - Establish benefits data in support of NHTSA 2013 Agency Decision
  - Public awareness & determine user acceptance
- Outcomes
  - Benefits and user acceptance data for supporting future federal actions
  - Archived road network data for supporting mobility, environmental, and other research
  - Multiple supplier sources for devices and infrastructure
  - Better understanding of the operational policy issues associated with the deployment of V2V and V2I

SAFETYPILOT

Six Driver Clinic Sites

Ann Arbor Model Deployment Site

Dynamic Mobility Applications

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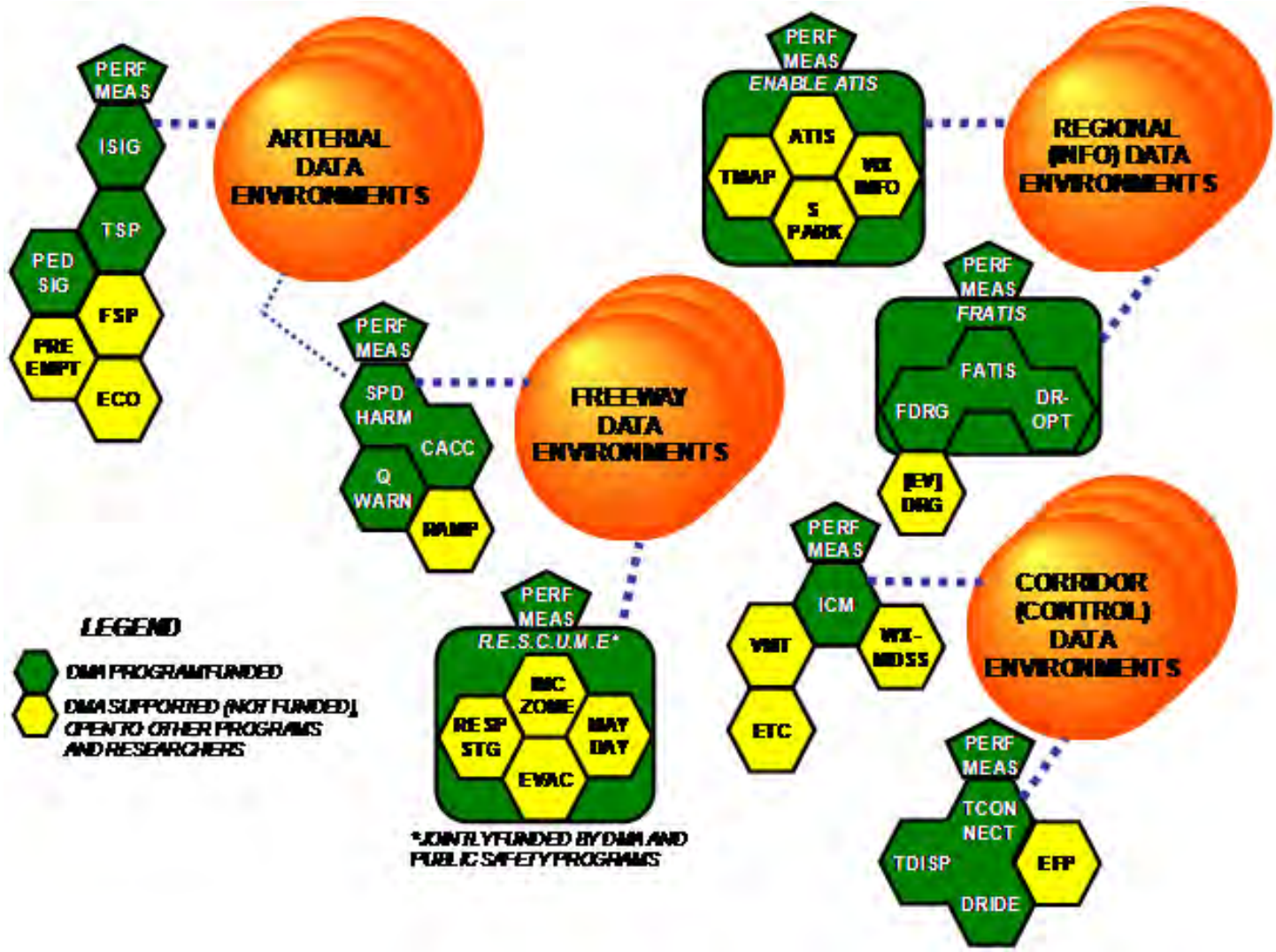

Dynamic Mobility Applications

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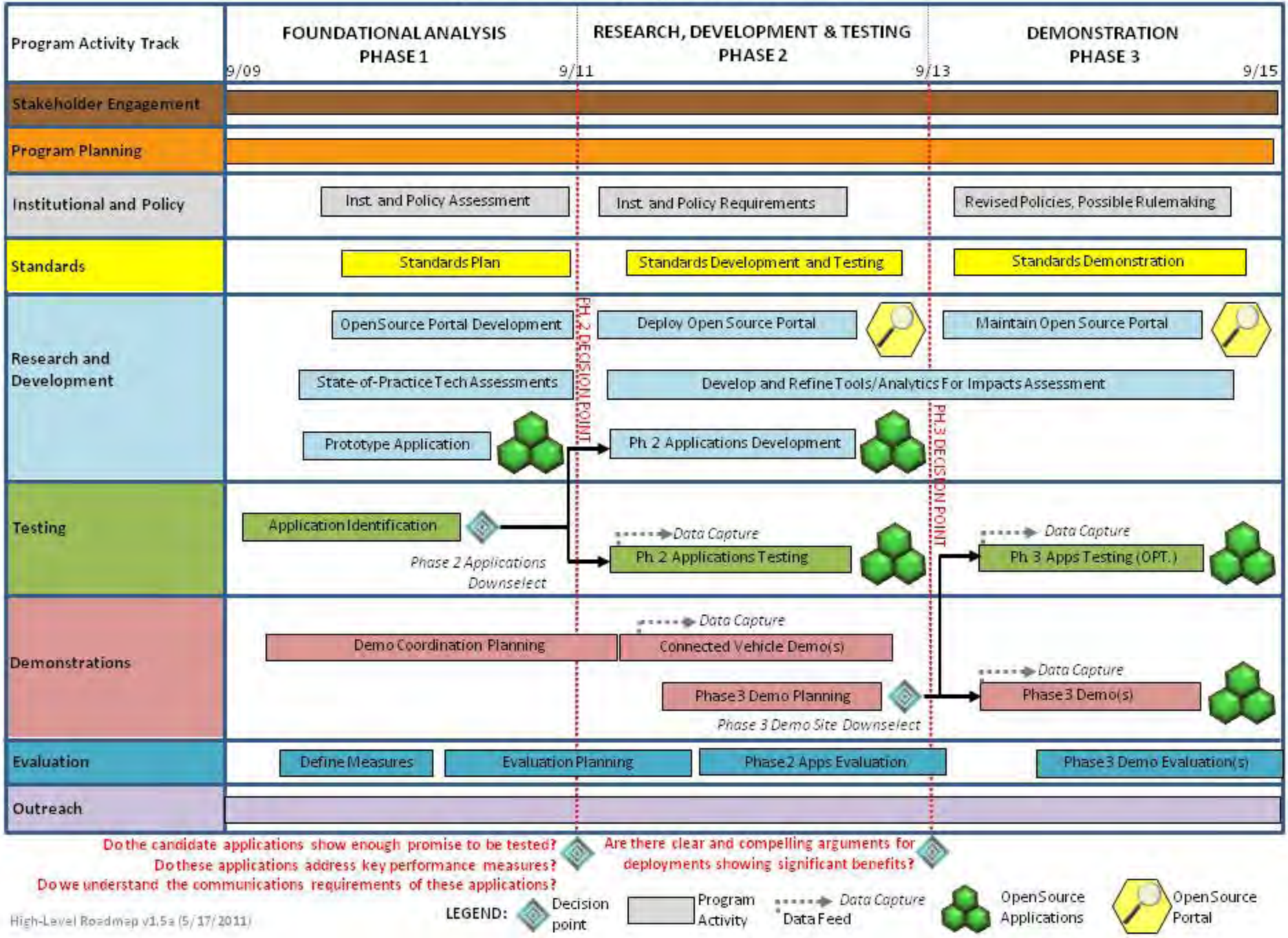
- Enable Advanced Traveler Information System (EnableATIS)
- Freight Advanced Traveler Information Systems (FRATIS)
- Integrated Dynamic Transit Operations (IDTO)
- Intelligent Network Flow Optimization (INFLO)
- Multi-Modal Intelligent Traffic Signal Systems (MMITSS)
- Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)

Dynamic Mobility Applications Program



AERIS Program

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Data Capture and Management

Vehicle Status Data

...65 mph...
....brakes on....
.....two passengers.....

Infrastructure Status Data

Weather Data

Data Environment

Truck Data

Location Data

Transit Data

AERIS

Environmental Applications

Transit Signal Priority

Low Emission ZONE

Real-Time Travel Info

"Green" Routes

"Green" Fleet Management

Phase & Adjusts -Time ditions

Eco-driving

AERIS Program

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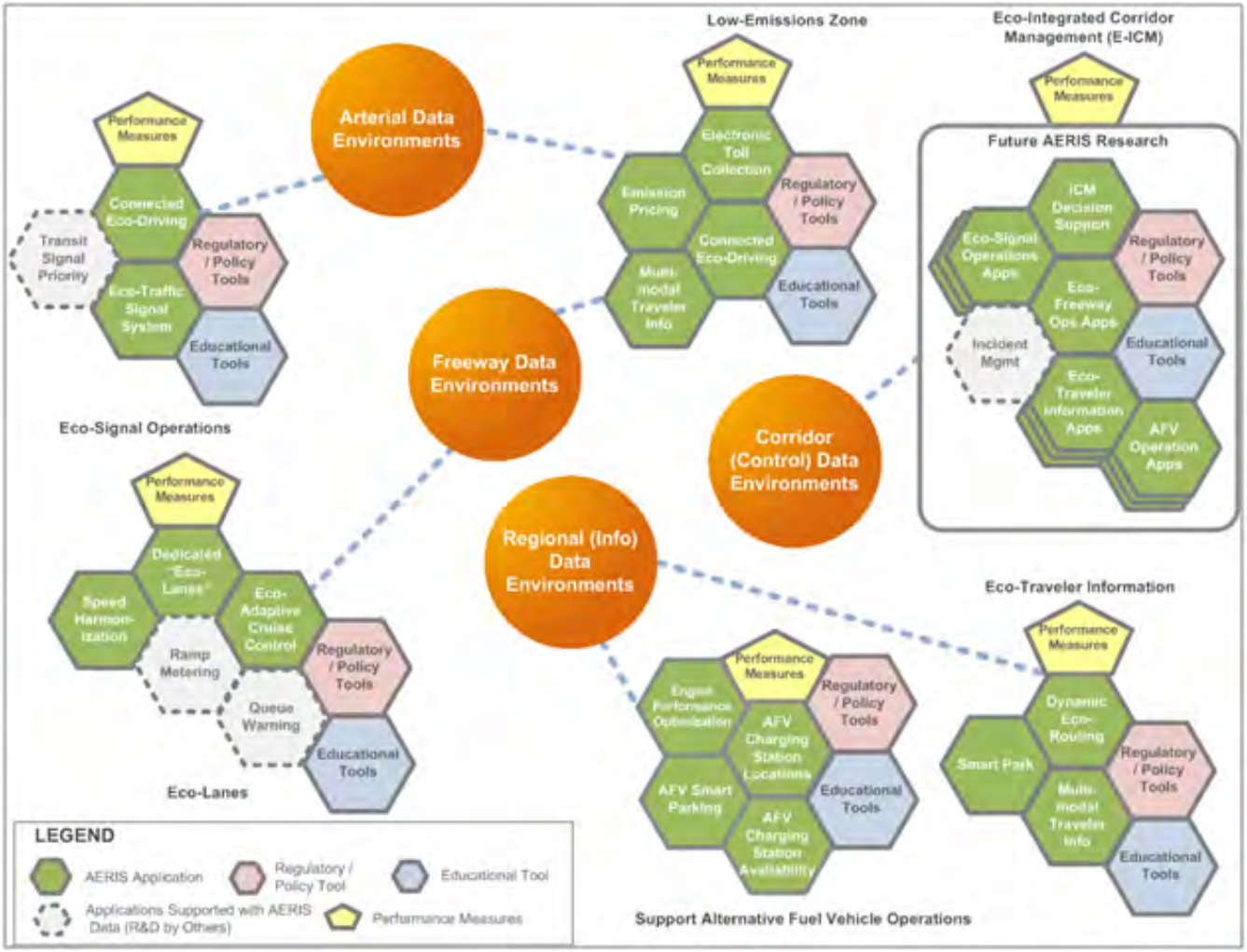
- Low Emission Zone
- Eco-integrated Corridor Management
- Eco-Signal Operations
- Eco-Lanes
- Support Alternative Fuel Vehicle Operations
- Eco-Traveler Information



Discussion

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Imagine a sustainable future:

- Transition to ubiquitous mobile data streams @ 0.1 s resolution
- Wealth of stationary/mobile data for real time and off line
- Public/private roles and timeline
- Who archives?
- Role for researchers?
- Links to energy/grid?

Some Issues

- Financing
- Privacy
- Cyber/Security
- Implementation
- Governance
- Deployment approach
- Data ownership
- Certification
- Sustainability
- Risk
- Liability

Research Call to Action

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- **Benefits**: understand definitive interactions among safety, mobility and the environment.
- **Data**: importance of keeping, sharing and leveraging data from demos, field operational tests and pilots.
- **Evaluation**: systematize and consolidate results from numerous evaluation efforts.
- **Demos**: need to move to cooperative deployment, public and private.
- **Collaboration**: in the U.S., the DOT should talk to the NSF, DOE and DOD
- **Fleets**: first.
- **Distraction**: see new NHTSA guidelines and confront the issue.

Research Call to Action

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- **Tools:** we develop them for every project, can't we leverage?
- **Implementers**: don't forget about them.
- **Roadside**: rapidly accelerate definition of requirements and build in flexibility.
- **Field Operational Tests**: what do they add up to?
- **Implement**: what we know works.
- **Policy**: new people at the table, be creative with the authority we have.
- **It's the People**: workforce of the future.
- **My Skeptical Neighbor**: win them over with the facts.
- **Funding**: confront it. New models for vehicle ownership and use.

Human Resources

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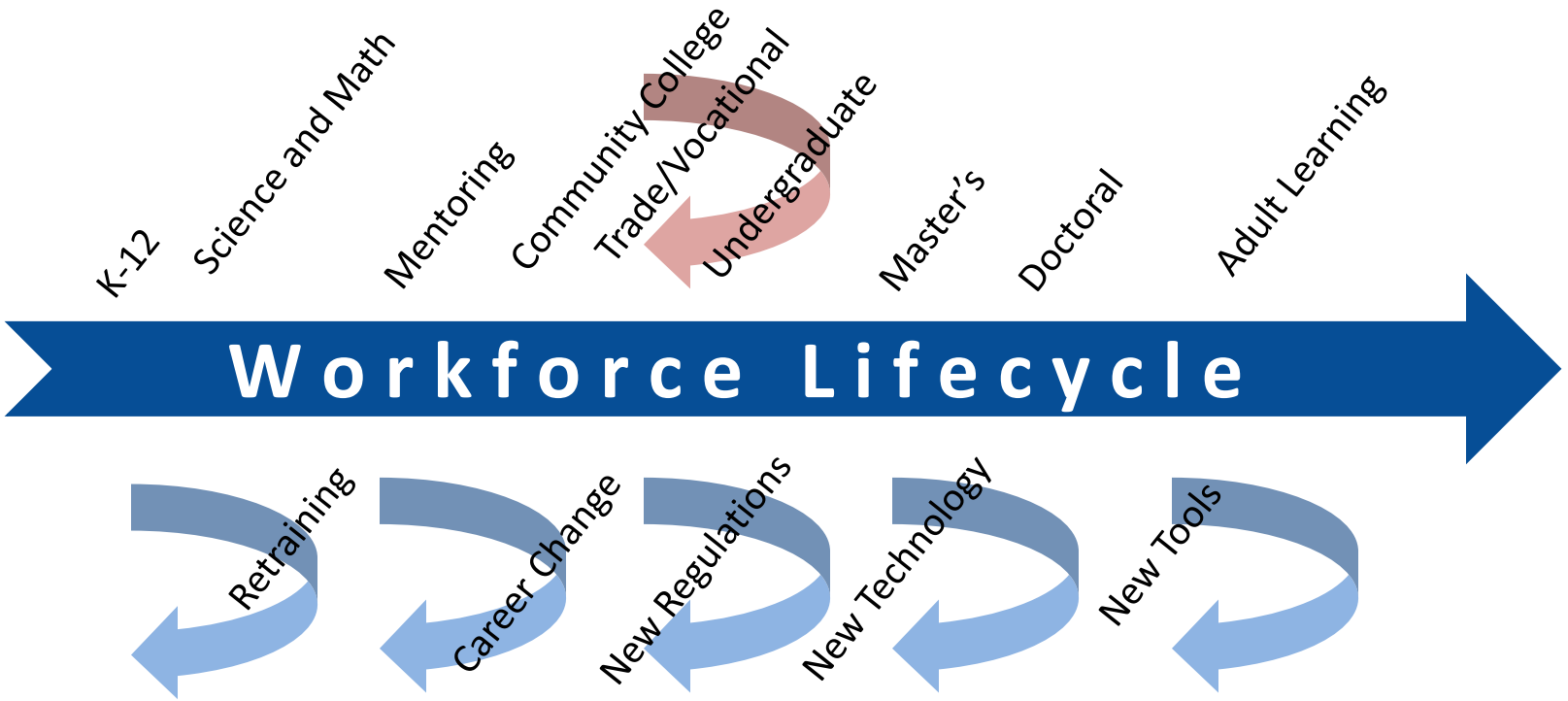
Not just technology and policy—the people are important

Strategic plan: need to attract, recruit, orient, retain, develop, and mentor a diverse, engaged, collaborative, and high performance workforce:

Anticipate demographic shifts, impending retirements, and operations/ITS needs

Increase the education and training level of the workforce



Charismatic Leadership

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- The people are important
- Workforce development initiative
- Living the collaborative spirit—sharing data and ideas
- Regional coordination/collaboration
- Recruiting and retaining management staff who are effective in keeping regional collaboration moving forward.
- Interpersonal skills may be as critical as technical skills.
- To be outstanding in your field, you need to be out standing in the field!
- In memory of Bill Kloos, Signal Systems, Lighting and ITS Manager at Portland Office of Transportation

Thank You for Your Attention

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