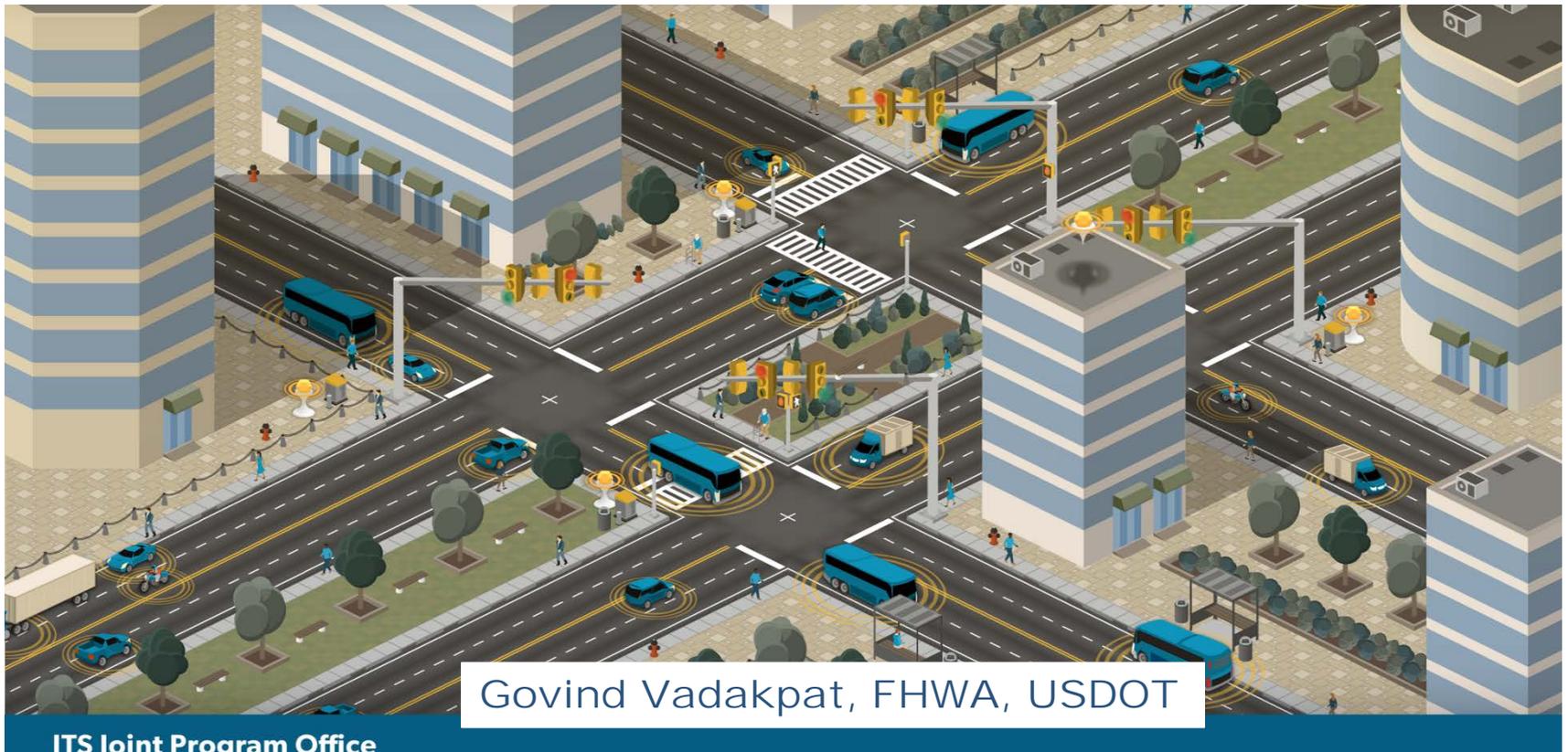




WHAT IS CV, AV and CAV AND WHAT'S IN IT FOR ME?



OVERVIEW



- Terminology
 - SAE Levels of Automation

- Overview of CV Pilot Program Award Site
 - Tampa (THEA) CV Pilot Deployment

- Planning Considerations for CAV

- How is this relevant to
 - Students/Researchers
 - Designers
 - Deployment Personnel

SAE Levels of Automation



LEVEL 0



There are no autonomous features.

LEVEL 1



These cars can handle one task at a time, like automatic braking.

LEVEL 2



These cars would have at least two automated functions.

LEVEL 3



These cars handle "dynamic driving tasks" but might still need intervention.

LEVEL 4



These cars are officially driverless in certain environments.

LEVEL 5



These cars can operate entirely on their own without any driver presence.

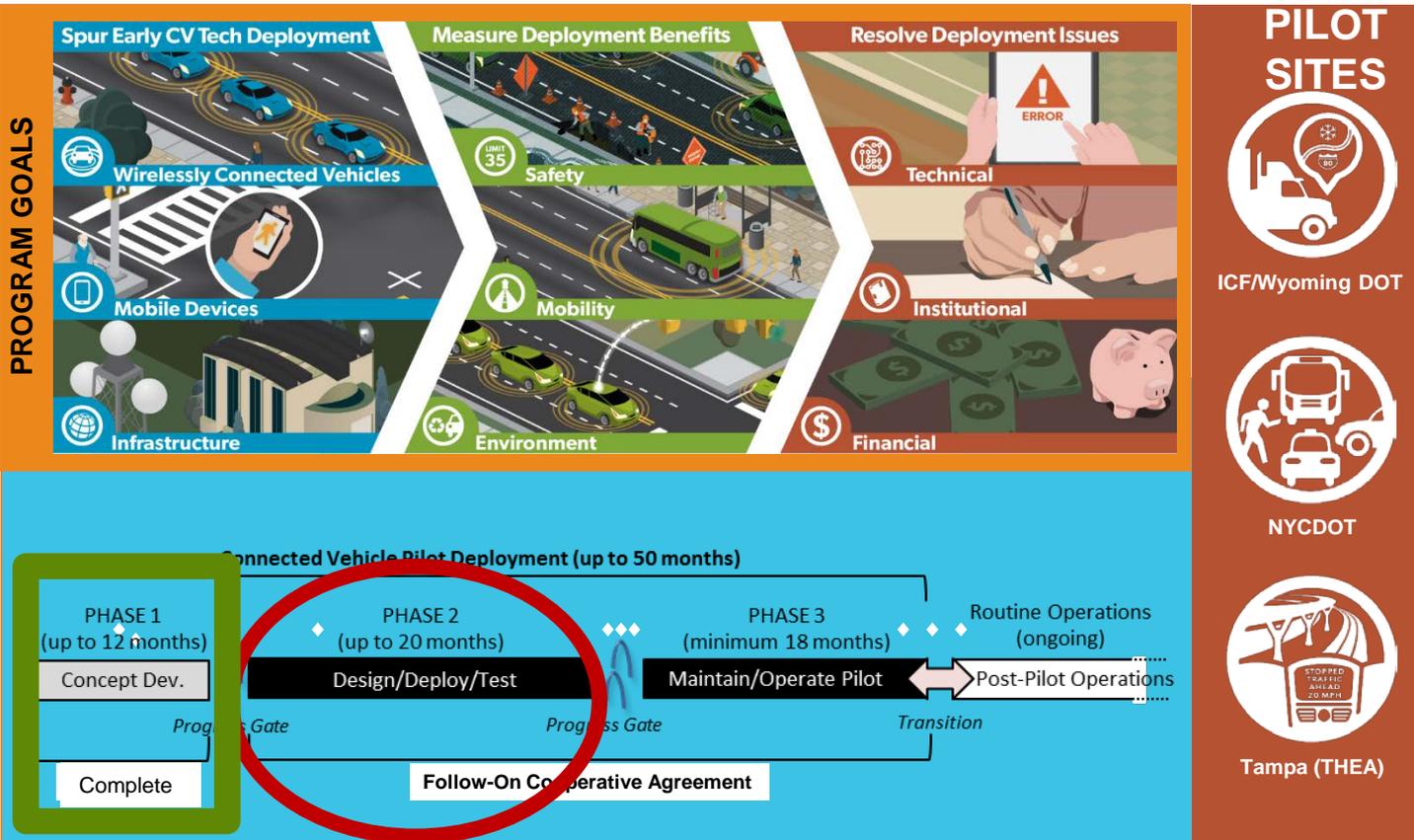
Source: Business Insider



U.S. Department of Transportation



Connected Vehicle Pilot Program



TAMPA (THEA) PILOT DEPLOYMENT SITE

AN OVERVIEW OF DOWNTOWN TAMPA





Participants



PHOTO: THEA

1,600

Privately Owned
Vehicles



PHOTO: NPR

500+

Pedestrian
Smartphones
(Android devices only)



PHOTO: THEA

10

TECO Line
Streetcar Trolleys



PHOTO: THEA

10

Hillsborough Area
Regional Transit
(HART) buses



Connected Vehicle Applications 1 of 2



APPLICATION	DESCRIPTION
End of Ramp Deceleration Warning (ERDW)	Alerts driver approaching curve with speed safety warning
Emergency Electronic Brake Light (EEBL)	Enables broadcast to surrounding vehicles of severe braking
Forward Collision Warning (FCW)	Warns driver of impending collision ahead in same lane
Intersection Movement Assist (IMA)	Indicates unsafe (i.e., wrong way) entry into an intersection
Intelligent Traffic Signal System (I-SIG)	Adjusts signal timing for optimal flow along with PED-SIG and TSP
Probe Date Enabled Traffic Monitoring (PDETM)	Uses vehicles as probes to calculate travel times
Transit Signal Priority (TSP)	Allows transit vehicle to request and receive priority at a traffic signal
Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV)	Alerts transit vehicle driver that a car is attempting to turn right in front of the transit vehicle
Wrong Way Entry	Warns driver of potential and actual Wrong Way travel direction



Connected Vehicle Applications 2 of 2



APPLICATION	DESCRIPTION
Pedestrian Collision Warning (PCW)	Alerts vehicle to the presence of pedestrian in a crosswalk
Pedestrian Safety	Single pedestrian application
Pedestrian in a Crosswalk Vehicle Warning (Ped-X)	Calculates the path trajectory of the pedestrian and approaching vehicles and logs an event if a potential conflict is identified.
Pedestrian Mobility (PED-SIG)	Gives pedestrians priority with signal phase and timing
Pedestrian Transit Movement Warning (PTMW)	Provides informational warnings to pedestrians that a bus or streetcar is starting up / stopping at an intersection



HMI Photos



Mirror display uses sticker to depict location and concept of warning.
Actual image is still in development

Source: Brand Motion and Global 5

Component Locations



REARVIEW MIRROR

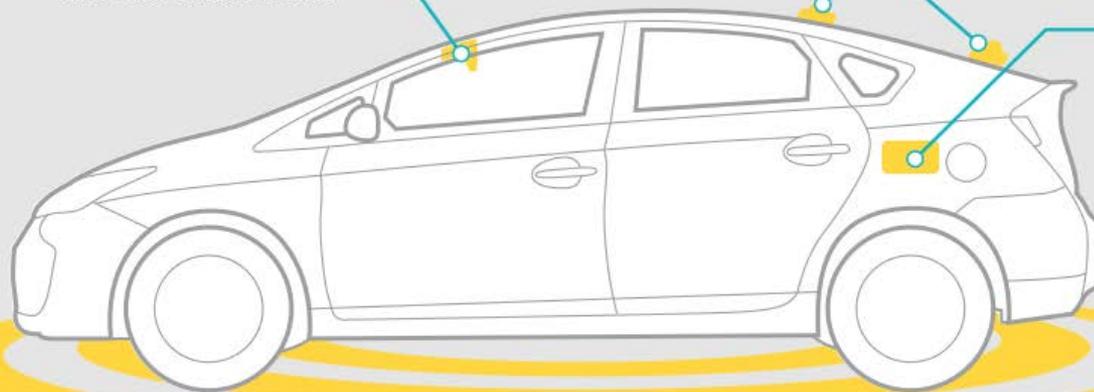
Displays safety messages and issues audio alerts

ANTENNAS

Send and receive data

SHORT-RANGE RADIO

Unit in trunk communicates with other equipped cars, traffic signals, crosswalks and more to prevent crashes and keep traffic moving



(Actual location of equipment may vary.)



Planning Considerations



Self Driving will happen

The most important question is not how they will happen but what are you going to do about it?

Time is now to get prepared/develop forecasts and study the impacts of CV/AV

- How will this impact land use

- What happens to VMT

- How will this impact Transit

- How do we retool our modeling procedures

Capacity expansion may be the thing of the past

Impacts of Shared Economy

Challenge to Planners: Where to Invest!



Workforce Development Needs – Transportation Planners



- Transportation Planners
 - Societal Trends
 - Technological Trends
 - Mobility and Environmental Trends



- Analyses tools to study the impacts of all the changes
- Development of benefit cost analyses
- Guidance for capital programs/projects with CAV



Workforce Development Needs – Students/Researchers



- Researchers
 - Technological Trends
 - Mobility and Environmental Trends



- Sensor fusion
- Data Analytics
- Control Theory
- Wireless Communications
- Computer Security

- Artificial Intelligence
- Blockchain Technology



Workforce Development Needs

– Design Engineers



- Traffic Operations Engineers
 - Societal Trends
 - Technological Trends
 - Mobility and Environmental Trends



- Computer networking concepts
- Data Analytics
- Wired/wireless Communications
- Computer programming (Python)
- Systems Engineering/Agile project management

- ITS Designers
 - DSRC Training (CVP)
 - Wireless Security
 - IoT Security
 - Smartphone Applications / Security

Workforce Development Needs – Deployment Personnel



- Vehicle Maintenance Issues
 - Aftermarket equipment connected to ODE-2 port
 - OEM Equipment connected to CAN Bus
 - FIPS 140-2 Level 2/3 HSMs
 - Antenna Replacements
 - Non-CV Aftermarket Device Interference
- Security / Privacy Issues
 - OEM Line Staff Training
 - Interoperability Among



- Dealership sales / Service Staff Training Programs
- Parts Suppliers / Retailer Staff Training
- Collision Repair Facilities Staff Training

