



# What Future Mobility Means for the LRTP

August 1, 2018

# Synthesis of Current Research

Florida DOT asked us to discover and synthesize research findings about future mobility.

## RESEARCH NOTES

- Focused on planning context, not vehicle technology
- Includes academic research, not reporting in the popular press
- Includes a review of more than 100 papers



# Florida DOT ACES

How do you think about future mobility?

- **A**utonomous
- **C**onnected
- **E**lectrified
- **S**hare



# Setting the Planning Stage

1. Question underlying assumptions. Future Mobility is changing the planning landscape
2. Societal issues are ever more important
3. The relationship of Private and Public is shifting
4. MPOs may facilitate a regional regulatory approach
5. Don't let uncertainty paralyze the planning process. Several trends are clear.



# Research Framework

## Transportation Technology Issues

- Impact on travel demand
- Impact on VMTs
- Impact on safety
- Public infrastructure requirements
- Impact on mode share

## Societal Issues

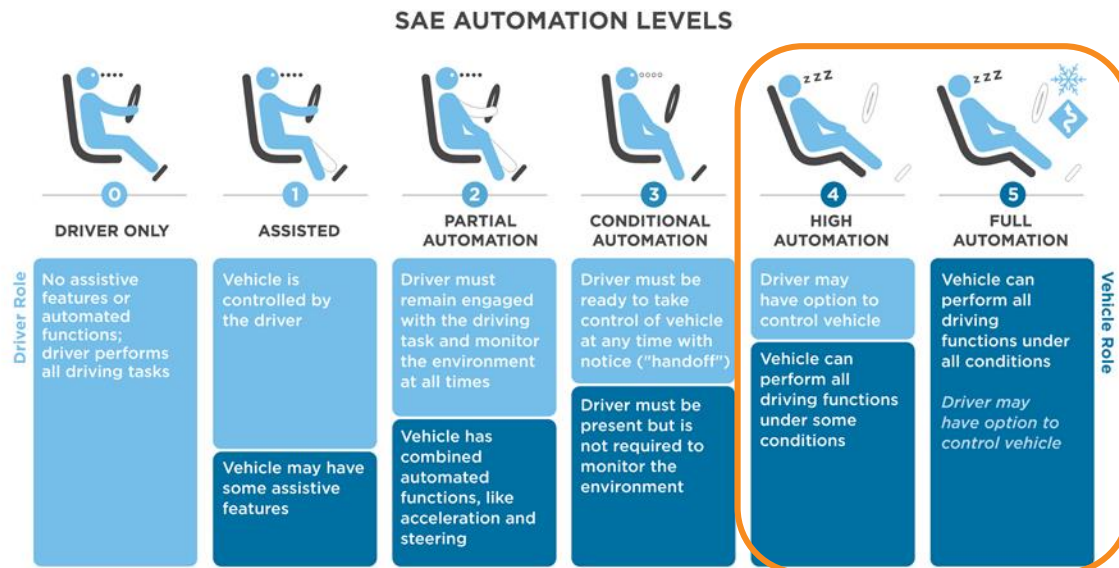
- Social equity & accessibility
- Impact on land use
  - Residential location
  - Business location
  - Parking
  - Urban streets
- Freight movement



# Future Mobility Definitions

## PASSENGER MODES

- Connected Vehicles (CV): conventional autos with on-board technology to permit communication with other vehicles, infrastructure, and internet
- Autonomous Vehicles (AV): Autos at SAE Level 4-5



# Future Mobility Definitions

## AUTONOMOUS VEHICLES (AV)

- Personal privately owned vehicles (PAV)
- Shared ownership vehicles (SAV) – a fleet may be owned and operated by a Transportation Network Company (Uber, Lyft), a transit authority (JTA), or a new business entity



# Future Mobility Definitions

## PURCHASING TRIPS TO MEET MOBILITY NEEDS

- Mobility as a Service (MaaS) or Mobility on Demand (MoD)

### *Examples*



Transit



TNC



Bikeshare



Carshare



Scooter



# Future Mobility Definitions

## FREIGHT MODE

- **CV-Truck:** CV technology applied to long-haul trucks
- **AV-Truck:** autonomous long-haul trucks
- **AV-Urban Delivery:** various automated systems for driverless delivery
- **Unmanned aerial vehicle (drone)**

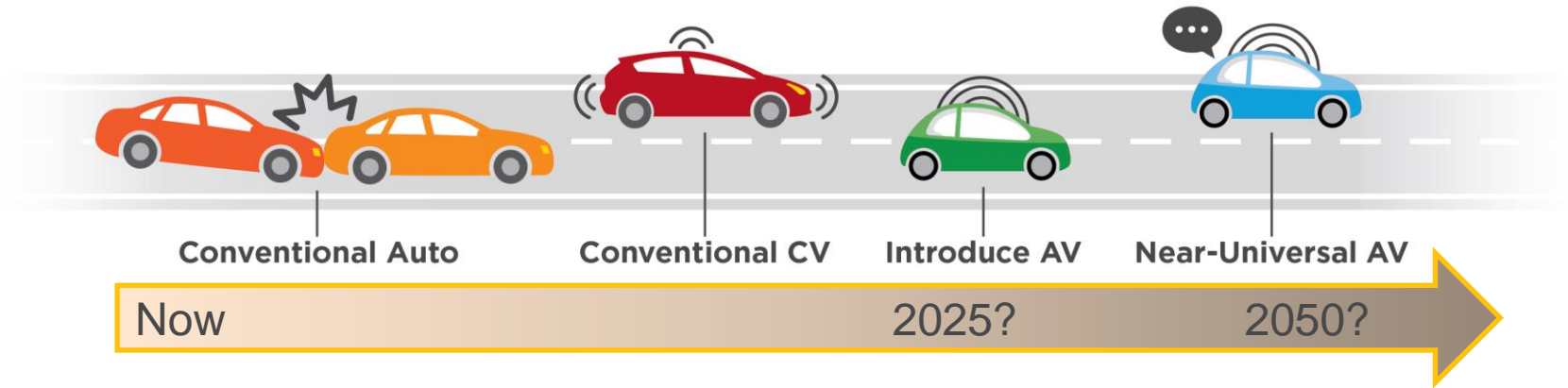




**FINDINGS:**

## **Overarching Issues**

# Overarching Issue: Adoption Timeline



- CV adoption is a near-future opportunity, pending in part on final guidance from NHTSA on communication protocol
- AV may move from testing to use within ten years
- Challenge: Decades of mixed traffic operation

# Overarching Issue: Regulatory Approach

- Private sector mobility providers are getting in front of local and state governments
- AV: Early focus on regulating testing, not public operation
- Broad range of policy incentives and disincentives can be considered
- New from NACTO “Guidelines for the Regulation and Management of Shared Active Transportation”



# Overarching Issue: AV Ownership

- Personally owned AVs and Shared AVs have very different impacts
- Will this be left to the marketplace, or is there an incentive to regulate?
- Initial deployment most likely to be shared fleets

Waymo buys up to 62,000 Chrysler minivans to expand self-driving fleet

*Auto News, May 31, 2018*

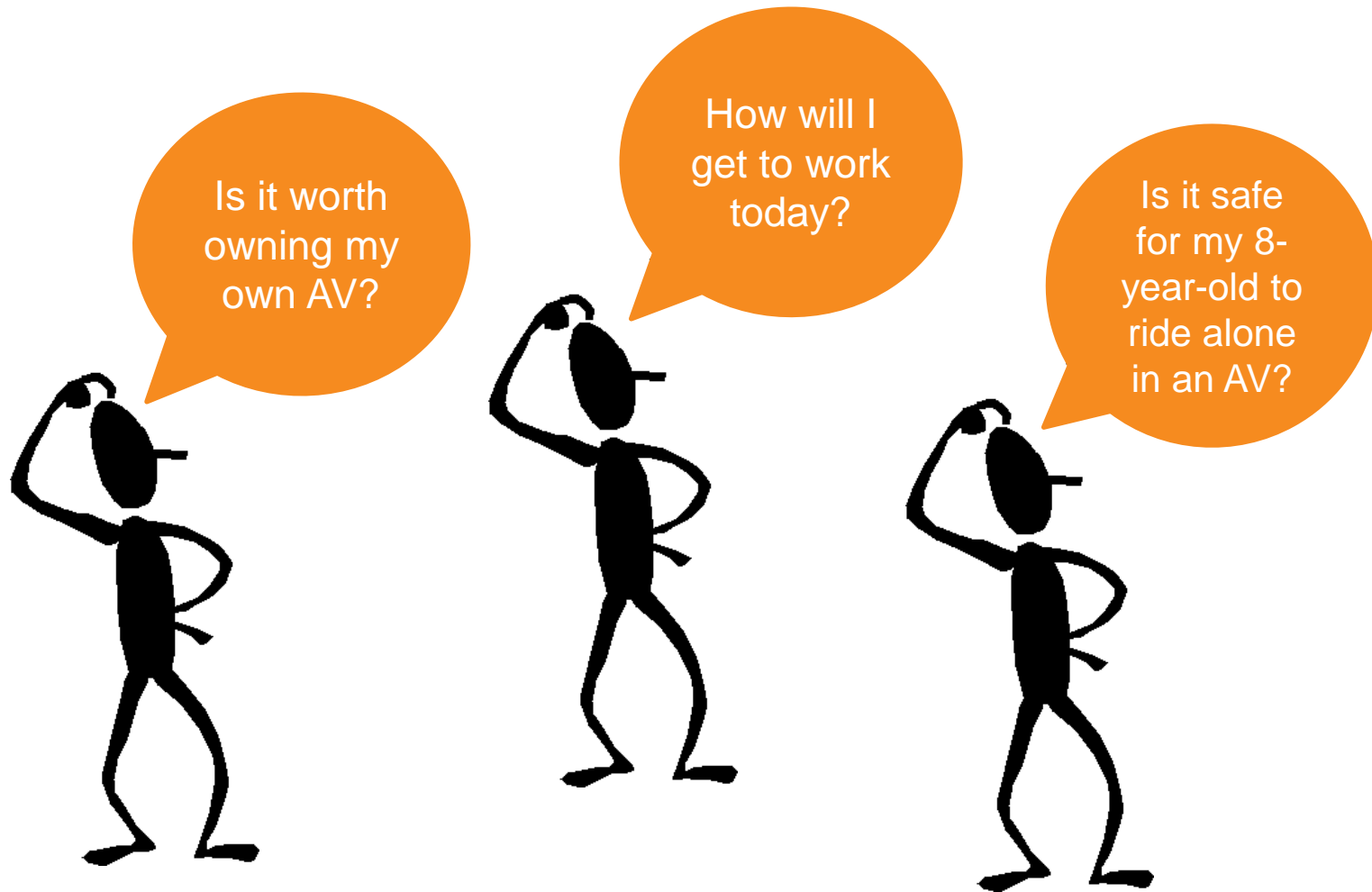




**FINDINGS:**

# **Transportation Technology Issues**

# Travel Demand: Personal Mobility Choices



# Impact on VMT: Autonomous Vehicles

Factors that may...



## Increase VMT

- Access by non-drivers (young, old, disabled)
- PAV ownership model
- Zero-occupant vehicle trips
- Land use decisions that increase trip length
- Lower cost per mile
- Reduced use of traditional transit services

## Decrease VMT



- SAV ownership model
- Redefining transit to include more shared-mobility options
- Mode shift to shared active transportation options
- Continued growth of e-commerce and micromanufacturing





# Impact on Safety: Current Driver Behavior

NHTSA finds that in over 90% of fatal crashes, police report driver behavior as the sole or contributing cause.

Drivers are:

- Impaired
- Drowsy
- Distracted
- Reckless/speeding
- Misjudge road and traffic conditions



# Impact on Safety: Connected Vehicles

Safety is the primary benefit of CV technology.

## V2I Applications

- Red light and stop sign violation warning
- Pedestrian in signalized crosswalk warning
- Curve speed warning
- Spot weather impact warning
- Reduced speed work zone warning

## V2V Applications

- Forward-collision warning and emergency electronic braking
- Intersection-movement assist
- Do-not-pass warning
- Blind-spot/lane-change warning



# Impact on Safety: Autonomous Vehicles

## Benefits

- AV eliminates driver-caused crashes
  - Some crashes will still be unavoidable

## Risks

- Cybersecurity concerns
- Mixed traffic transition period



# Impact on Safety

Research suggests:

- CV may result in a **50%** crash reduction
- AV may result in a **90%** crash reduction

*Caveat: Assumes high percentage of fleet penetration*



Source: USDOT ITS JPO

# Public Infrastructure Requirements

New mobility options impact publicly funded infrastructure.

- CV will require communications infrastructure to support V2I applications
- Traffic control devices (markings, signs, signals)
- AV reduces “safety buffer”, may allow narrower lanes
  - Permit redesign of urban streets while still providing for all users
- Designing for EV charging requirements
- Consider impact on maintenance protocols and budget



# Impact on Mode Share

Rather than focusing on the potential loss of ridership in traditional service models, [researchers] propose reexamining the role that transit can play in providing mobility in a more automated world.

Transit operators become providers of shared mobility:

- Traditional rail and bus services
- Microtransit replaces inefficient routes, provides first/last mile connections
- App-based paratransit





**FINDINGS:**

# **Societal Issues**

# Equity Concerns

“The innovative mobility options...have the potential to increase the accessibility of transportation for many Americans, including these disadvantaged populations. But they may also leave **people who are already transportation-disadvantaged** further behind, either because they will not be able to take advantage of these new services (making them relatively worse off) or because the rise of these new services could reduce some existing services (making them absolutely worse off).”

*National Research Council's Committee for Review of Innovative Urban Mobility Services. 2016. "Special Report 319: Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services,"*





# Equity Concerns

Access to mobility services requires smartphone and bank account.

As many as 36% of low-income households do not have a smartphone (Pew Research Center), and 22% do not use a bank (Brookings Institution).

- Transit operators that do not adapt to new mobility models may have to reduce traditional services
- Persons with disabilities may have reduced access
- Role in evacuation planning and operation



# Future Mobility and Land Use

- What is the effect on residential location choice?
- What is the effect on employment-based site location choice?
- What are the impacts on parking demand and location in the urban core and in suburban locations?
- What are the constraints and opportunities for the reuse of street space?



# Impact on Land Use: Residential Location

The influence of CAV on where people live is a key question.

- People may choose **exurban/rural location** to take advantage of lower land/housing costs
  - Time in an AV can be productive
  - Cost of vehicle operation may be less per mile
- People may choose **urban locations** because of greater access to social and cultural activities and transportation options

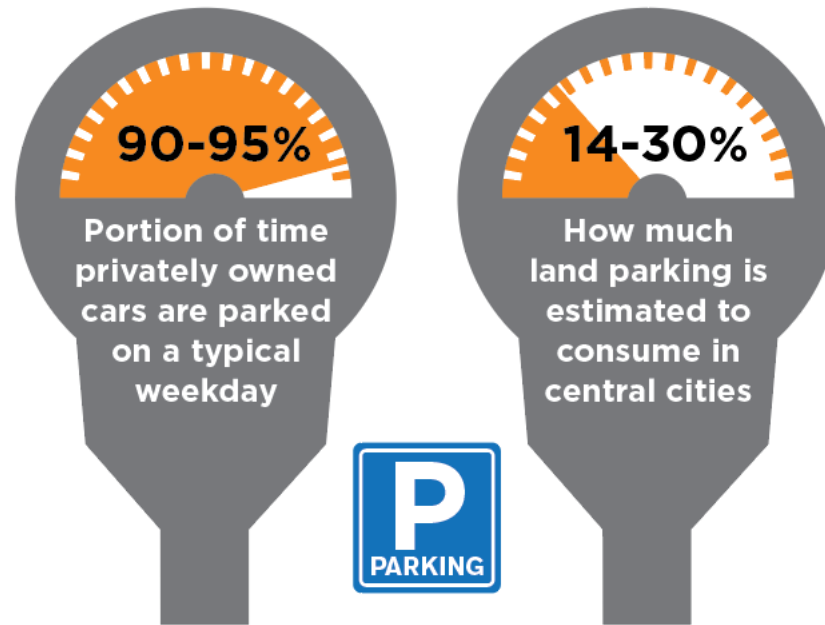


# Impact on Land Use: Business Location

- Transportation is only one factor in business location decision
  - Access to customers
  - Access to workforce
  - Access for goods movement
- Future manufacturing and distribution technology may change all of those factors
- Zoning codes will need to be responsive to changing business landscape



# Impact on Land Use: Parking



Privately owned cars are parked almost all of the time, leading to demand for parking lots, structures, and on-street spaces.

# Impact on Land Use: Parking

- All AVs will increase demand for curb space for pick-up/drop-off
- Privately owned AVs may be sent home or to fringe lots to avoid cost of urban core parking, reducing need for urban spaces at the cost of increased VMT
- SAVs require storage and maintenance facilities, but these may be in remote locations; SAVs will be in operation for many hours/day

*Cities will need to monitor dynamic changes in parking demand and modify on-street parking ordinances and off-street parking zoning requirements accordingly.*



# Impact on Land Use: Rethinking Urban Streets

Using the available public space to accommodate all modes is not new.

- Where are bus lanes needed?
- Will cyclists feel safer with protected bike boulevards?
- Do TNC cars and delivery trucks share loading zones?
- How much space does reducing lane width free up?
- How can dockless bikes, e-bikes, and scooters be accommodated without consuming sidewalk space?



# Freight Movement: Long Haul

- Trucks move the majority of freight in the US
- Long-haul trucking has different needs than urban delivery
- CV: Platooning of conventional trucks saves fuel
- AV: Autonomous trucks individually or in platoon increases productivity
  - Likely need drivers for first/last mile connections





# Freight Movement: Urban Delivery

Urban goods movement: from tractor-trailers to parcel delivery trucks

- Increased opportunities for off-hours delivery
- Automation of e-commerce: delivery bots to lockers on wheels
- Increasing demand for “immediate” delivery





**DISCUSSION:**

**What Does This Mean for the LRTP?**

# What Does This Mean for the LRTP?

- More uncertainty about how the core planning issues of personal mobility and land use change over time
- Need to be very strategic about investment choices
- Consider scenario planning built on a foundation of credible data and strategic models
- Recognize the importance of policy and regulatory approaches





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**THANK YOU!**

