

# How is Transportation Technology Evolving and What Does it all Mean?



Intermountain MPO / TMA /  
Transit Annual Meeting  
April 26, 2016

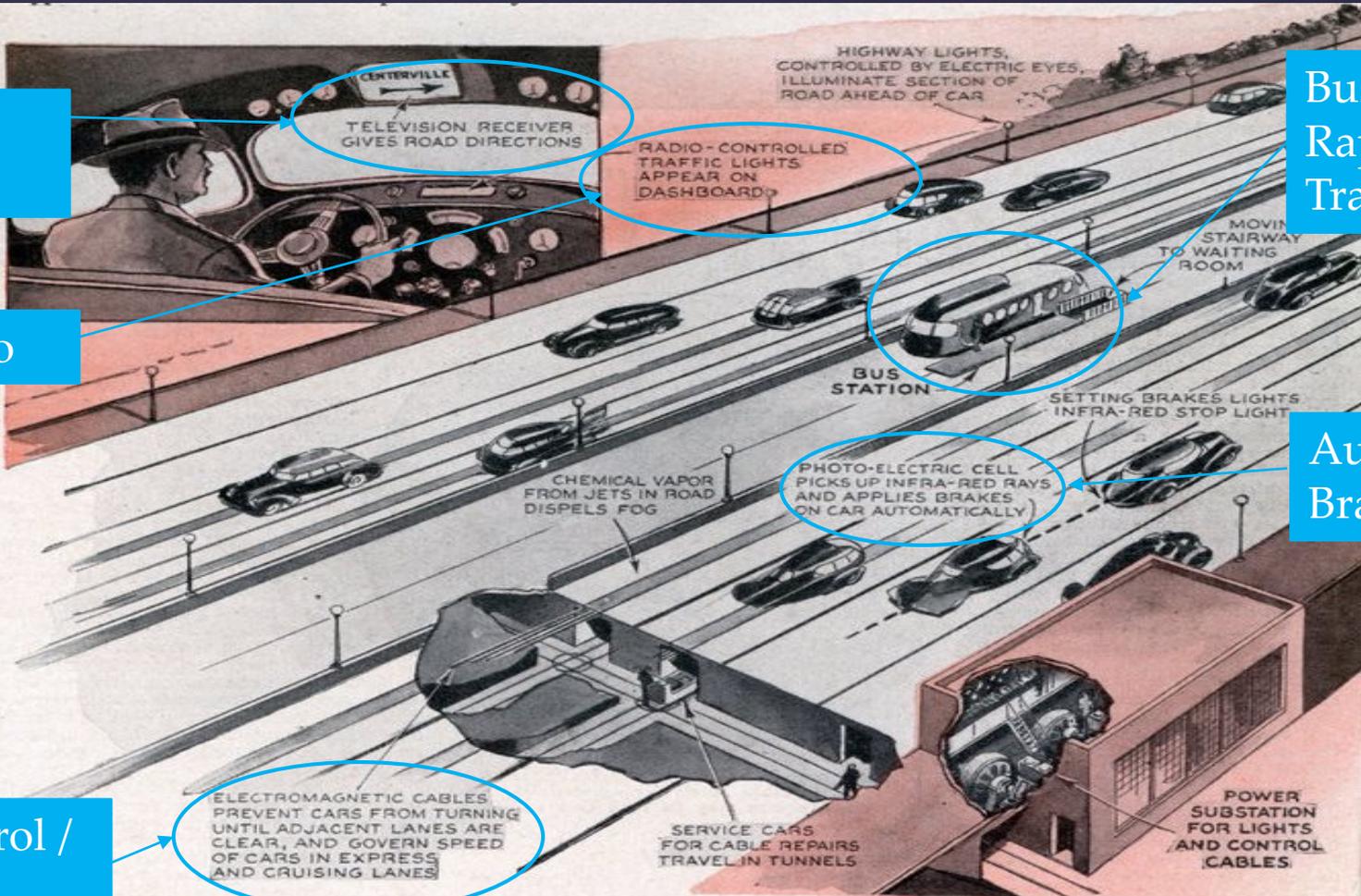
GPS /  
Mapping

Traffic Info

Lane Control /  
Blind Spot

Bus  
Rapid  
Transit

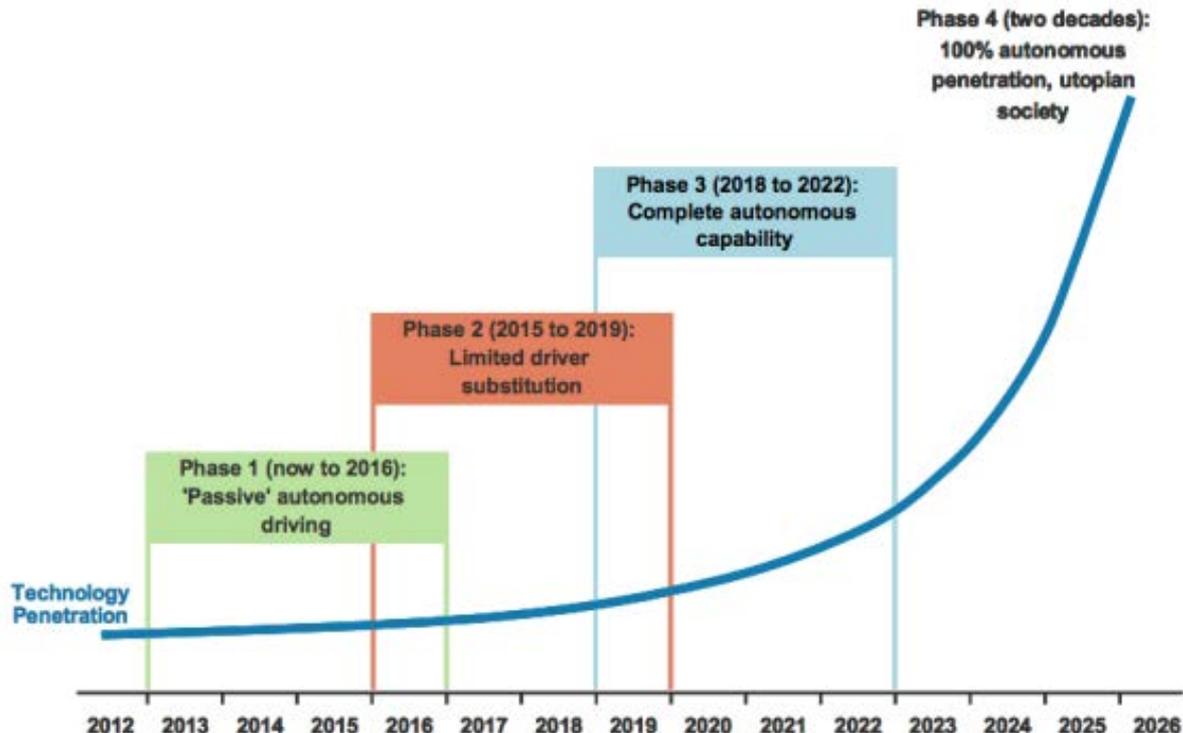
Automatic  
Braking



# LEVELS OF AUTOMATION

- 0 NO AUTOMATION**  
 Forward collision warning, lane departure warning, blind spot monitoring
 
- 1 FUNCTION SPECIFIC AUTOMATION**  
 Temporarily cedes control of either forward (speed) or lateral (side-to-side) movements, but not at the same time. Dynamic brake support, electronic stability control, adaptive cruise control.
 
- 2 COMBINED FUNCTION AUTOMATION**  
 At least two primary control functions designed to work in unison. Adaptive cruise control in combination with lane centering.
 
- 3 LIMITED SELF-DRIVING AUTOMATION**  
 Enables the driver to cede full control of all safety-critical functions. Designed so that the driver is not expected to constantly monitor the roadway while driving.
 
- 4 FULL SELF-DRIVING AUTOMATION**  
 Designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip.
 

Exhibit 20  
**Timeline for Adoption**



Source: Company data, Morgan Stanley Research



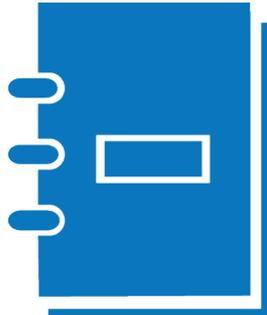
- ❖ IEEE survey of 2000 experts in autonomous vehicles
  - ✓ Biggest obstacles are legal liability, policymaker and consumer acceptance.
  - ✓ By 2030, new cars will not have rear view mirrors, horns & emergency brakes.
  - ✓ By 2035, steering wheels and gas / brake pedals will be gone.

# UNRESOLVED ISSUES FOR PUBLIC AGENCIES

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➤ Over 100 research questions

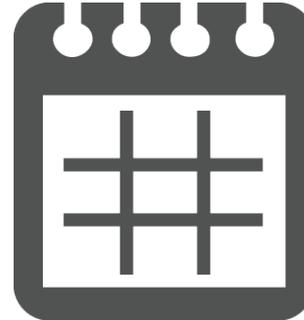
Policy



Infrastructure



Planning



Modal Apps



# What does this mean?

## PLANNING FOR CONNECTED AND AUTONOMOUS VEHICLES

### Engineering

- ❖ Traffic Engineering.
- ❖ Roadway Design.
- ❖ Speed Limits.
- ❖ Parking.
- ❖ Freight Operations.
- ❖ Safety.

### Planning and Policy

- ❖ Long Range Transportation Plans.
- ❖ Land Use and Urban/Rural Form.
- ❖ Impact Assessment.
- ❖ Driver Education and Licensing.
- ❖ Vehicle Regulation.
- ❖ Insurance and Liability.
- ❖ Safety.

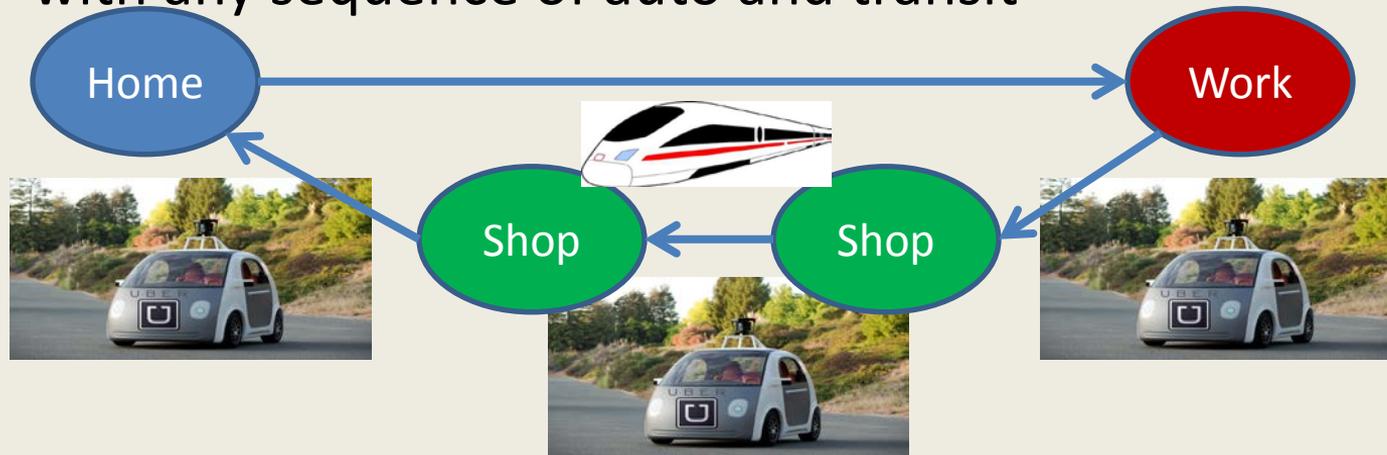
# How will autonomous vehicles affect travel demand and traffic?

- (1) Elderly, youth, disable, and other people w/o driver license will have access to cars
  - ABM: SOV, HOV/driver modes not constrained by age



# How will autonomous vehicles affect travel demand and traffic?

- (2) Cars available at any location any time, not necessarily from home for entire tour
  - ABM: Trip mode combinations on the tour less restrictive with any sequence of auto and transit



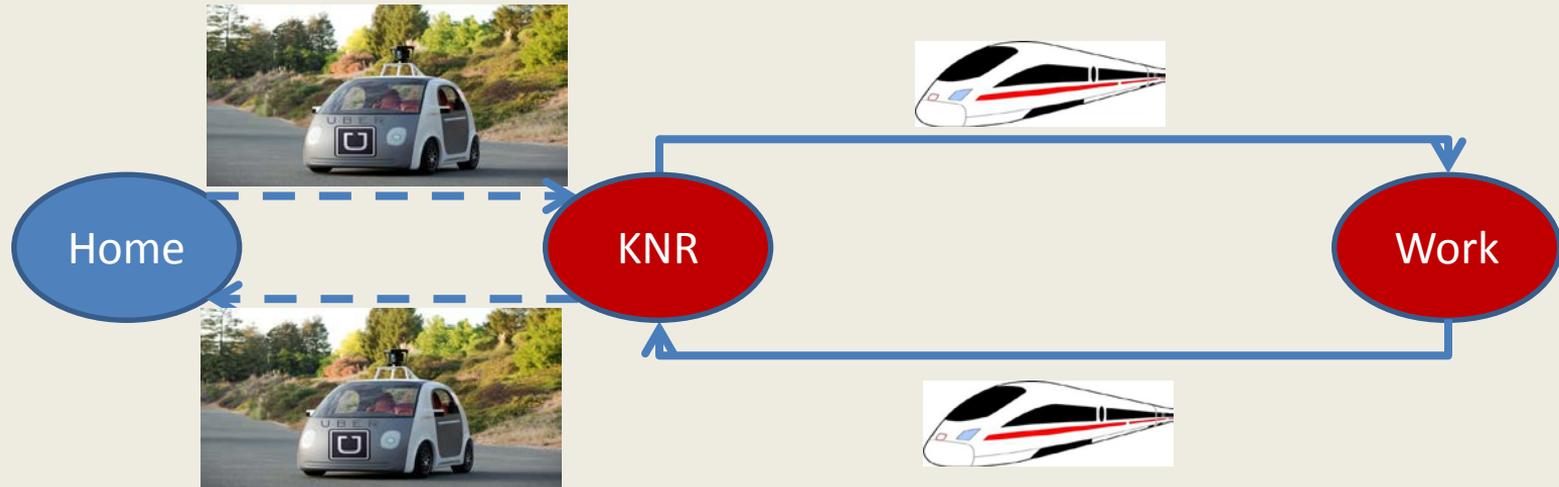
# How will autonomous vehicles affect travel demand and traffic?

- (3) Empty repositioning trips made by CAVs
  - ABM: Certain travel tours with 1 destination and long duration (4h+) may have car repositioning trips to and from home



# How will autonomous vehicles affect travel demand and traffic?

- (4) General convenience of CAV-KNR versus PNR and transit with walk access/egress:
  - ABM: KNR convenience parameters equalized to auto



# How will autonomous vehicles affect travel demand and traffic?

- (5) In-Vehicle Time Productivity:
  - ABM: productivity “Bonus” for premium transit (-25% of IVT) applied to CAV



# How will autonomous vehicles affect travel demand and traffic?

- (6) Optimized use of highway capacity, more efficient driving, increased intersection capacity:
  - ABM: Assumed link capacity growth 5-10%

