Autonomous Vehicle Shuttles

What do we know?
AV shuttles are becoming the most heavily researched automotive technology. Yet only a fraction of the future deployable capabilities are available today.

The Challenges
- Public and agency acceptance
- Workforce impact
- Capital investment issues

Technology availability and maturity
- Demonstrated safety and security

The Hurdles
- ADA compliance
- Equity
- Executive Support
- Regulations
- Staffing and skill sets

Funding
- Internal impediments
- Work rules
- Role-down of liability and risk
- Available technology

FTA Transit Automation Research

The Benefits
- Increased safety
- Reduced liability
- Decreased maintenance costs
- Increased service availability
- Reduced environmental impacts
- Operation efficiency
- Increased customer satisfaction
- The decision to contract out the AV service or expand internal agency service
- Vehicle size
- Customer assistance

General Legislative
- 29 states, including Washington DC, have enacted AV technology legislation
- 10 states have enacted executive orders regarding AV technologies

Enacted Legislation
- Most states that have enacted regulation on AVs require vehicles to have a fallback when system fails
- Some states allow that the driver does not have to be present in the vehicle
- Liability is placed on user (not on manufacturer or service provider), even if they are not in the vehicle

Costs
- Based on limited sources, since the technology is new and not widely deployed or piloted
- Combinations of grants and public/private investments
- Champion/partnered local businesses, institutions, municipalities, and DOTs
- January 2016, USDOT committed $4+ billion over the next 10 years

Policies Federal
- SELF Drive ACT (HR 3388)
- NHTSA federal guidelines—A Vision for Safety 2.0 (Sep. 2017) and 3.0 (Oct. 2018)
- AV START Act (BAG17C69)

What should North Carolina do?

Legislatively — Per HB 469, NC requires an operator to be present in the AV, but the operator is not required to have a driver’s license; “Fully AV” is defined as a vehicle with the ability to act safely if the program fails; An adult must be present if a rider is under 12

Testing — NC is home to one of the proving grounds to test AV technology as per USDOT

Considerations — Available technology; campus or downtown deployment; rural deployment needs

Recommendations
- Authorized agencies to request an ordinance to operate an AV shuttle on a public road, if one does not exist
- Request permission to operate an AV shuttle on a campus sidewalk, if necessary
- Look to partner with a municipality, a campus, or a business with large campus to pilot a shuttle
- Explore grants for pilot funding (FTA, Bloomberg, USDOT, Challenges, etc.)
- Reach out to multiple vendors to create pilot program
- Research areas that would like a deployment, but don’t have the technology; partner with NCDOT
- Implement an in-reach public workshop to discuss concerns and obtain buy-in; coincide with demonstrations

What is an AV Shuttle?
Autonomous vehicle (AV) shuttles are equipped with advanced sensors and computing abilities to perceive and communicate with their surroundings. The shuttles would perform all critical functions (steering, acceleration, and braking) without an operator, while carrying pedestrians along fixed guideways at relatively low speeds.
Technology
- Fiber, wireless technology, and integrated apps to function
- Differential GPS, Lidar sensors, cameras, odometry sensors, IMV sensors

Most Popular Shuttles
- **Navya ARMA**
  - 15-passenger capacity, 9-hour functional time, 16 mph max speed
  - Uses GPS, Lidar sensors, cameras, odometry sensors, IMV sensors
  - $225,000
- **Easymile EZ10**
  - 12-passenger capacity, 14-hour functional time, 25 mph max speed
  - Uses cameras, Lidar sensors, differential GPS
  - $225,000-$250,000

### What is Fallback?
**Minimal Risk Condition**
- Required of AVs in many states
- The driving system must be able to recognize when it can no longer operate safely
  - “A minimal risk condition will vary according to the type and extent of a given failure, but may include automatically bringing the vehicle to a safe stop, preferably outside of an active lane of traffic.” —NHTSA

### NHTSA’s Best Practices for Legislatures
- States should not over-regulate testing or limit testing to manufacturers
- States should manage AV registration clearly and accurately
- States should set up communication with AVs to gather data and improve safety
- States should review existing laws to make sure testing and deployment of AVs isn’t impaired