



## **NORTH CAROLINA**

Department of Transportation



# North Carolina: Open for Autonomy AV's are Here! NCDOT's Autonomous Shuttle Project

Stephanie L. Sudano, P.E.  
Multimodal Transportation Special Projects Engineer

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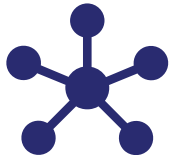


*NCDOT is advancing emerging technology by piloting innovative transportation tools into communities to foster innovation.*

# Project CASSI

NC wants to position itself on the leading edge of transportation technologies

- driving economic growth
- attracting high tech industries
- producing research
- educating citizens
- innovating transportation solutions



# Levels of Automation

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

Full Automation



0

## No Automation

Zero autonomy; the driver performs all driving tasks.

1

## Driver Assistance

Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.

2

## Partial Automation

Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.

3

## Conditional Automation

Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.

4

## High Automation

The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.

5

## Full Automation

The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

# Why an AV shuttle is the best choice for NC's first project:

- More vehicle run time at Levels 3 or 4 provides more research opportunities of vehicles operating almost entirely in autonomous mode
  - Increased learning about “vehicle to infrastructure” autonomy
  - More flexible to test different use cases
  - Lower speed “approachable”
  - Handles a group of people
  - Easy to get in/out of
  - Unique and appealing looking – increases educational opportunity



# How CASSI Will Operate

- Route is pre-programmed, including stops
- Continuously reads and compares environment via LIDAR, RADAR, GPS
  - Reacts to changes in environment - pedestrians, vehicles, bicycles, etc.
  - Defaults to stop when a change recognized
  - If change resolves (goes away), CASSI will resume
  - If change does not resolve, operator takes CASSI out of AV mode and drives around the obstacle



## Other Reasons for CASSI

- Connected, autonomous and electric vehicles are driving the future of transportation improvements
  - Safety improvements
  - Efficiency improvements
  - Accessibility for underserved populations
  - Infrastructure footprint reduction
  - Transition to a clean energy economy



# Research

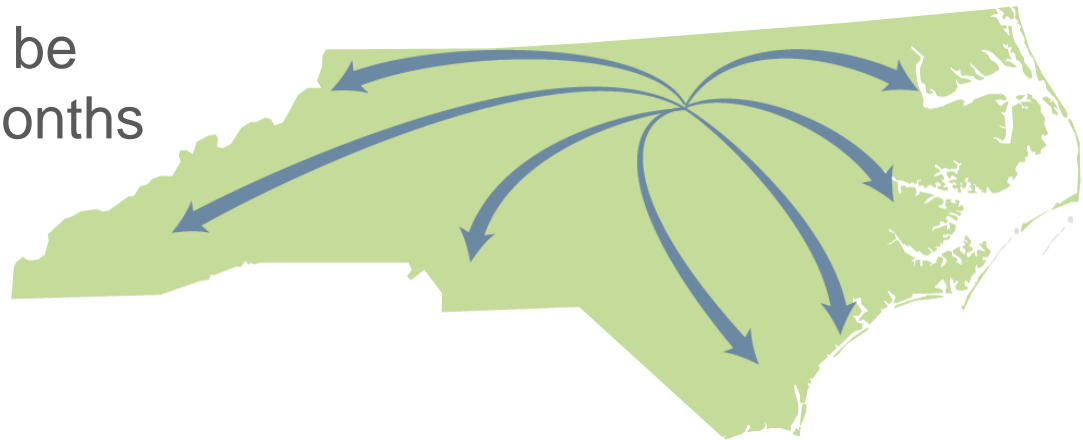
- NCDOT will partner with universities to gather data, to publish results, and to establish best practices for AV deployment:
  - V2I (Vehicle to Infrastructure) performance
  - Safety
  - Ridership
  - Public experience and perception
  - Benefits
  - Strengths and weaknesses of automated and connected technologies





# Many Communities, Many Opportunities

- Opportunities for NCDOT and NC's communities to test AV technology in various use cases
  - Rural, Urban communities
  - First/last mile solutions
  - Limited mobility solutions
  - Community circulators
  - Universities
- Two AV shuttles will be deployed over 24 months at various sites statewide



# CASSI NC Project Delivery

## Teams:



### CASSI NC Transit Deployment Team

- NCDOT Division Leaders
- Crosscutting disciplines involved



### CASSI NC Technical Oversight Team

- Small Internal Team
- Day to Day Oversight
- Technical Expertise

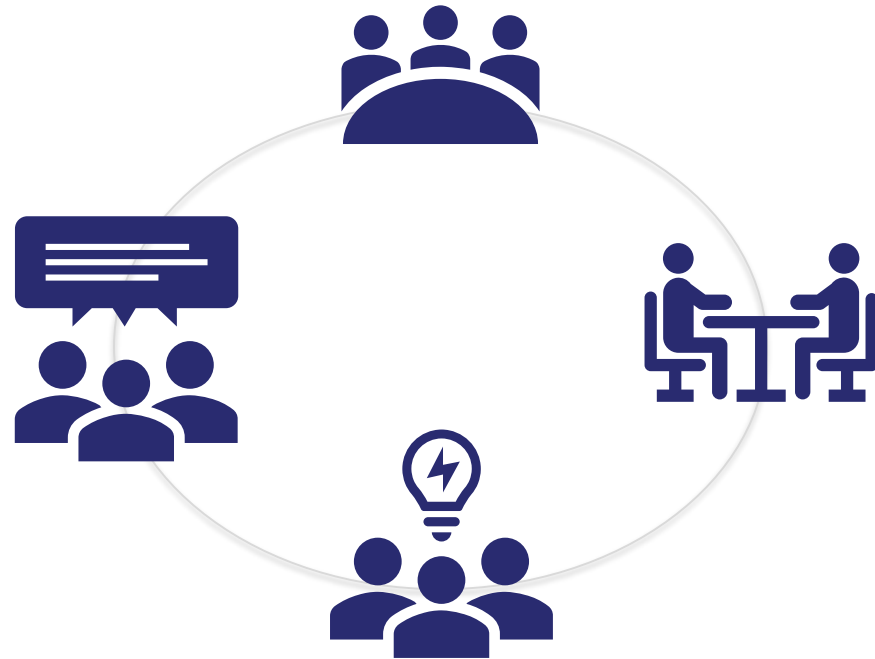


### CASSI NC Community Deployment Teams

- Local leaders, city, town, and university leaders and staff members

# Stakeholder Outreach, Engagement & Collaboration

- Other AV and Transit initiatives in NC
- Local Communities
- Universities
- Public Agencies
- Private Partners
- Other AV and Transit initiatives nationwide



# CASSI NC Project Timeline

- Phase 1: Deploy into two communities
- Phase 2: CASSI NC Competition & Deployment additional deployments

## Timeline:

- January 2020 NC's CASSI Shuttles arrive
- February 2020 Deployment Phase 1
- January – February 2020 Phase 2 Competition
- July 2020 Deployment Phase 2
- January 2022 CASSI NC Deployment ends



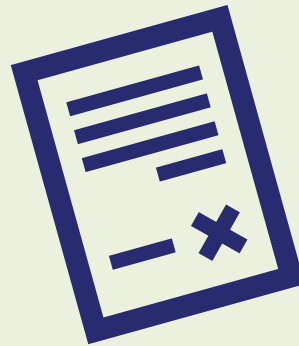
# How we got to where we are Today

- NC passed an FAV law in 2018
  - The law – in its most simple terms – was designed by legislators to make it easy to deploy FAV's on NC's roads
  - **BUT** technology is changing so fast that you don't really know what the law needs to say
  - AV shuttles do not fit neatly into NHTSA's vehicle regulations – unless they are imported from another country
  - NC's "additional vehicle regulations" are in the way of forward progress
- With persistence, creativity, collaboration, and ingenuity NC is closing in on its first shuttle deployment

# Challenges

- **NC's regulatory agencies and different interpretations of the law**
- Reaching and engaging Communities
- Funding
- Logistics of Multiple Pilot Locations
- Short-term Deployments (4-6 months)
- Diverse Demographics
- Public Perception/Reception
- Who knows what else?  
This is NEW!





*In addition to the CASSI project, we are also looking at recommending tweaks to the existing FAV legislation to more easily allow other deployments in North Carolina.*

*The industry changes rapidly, so states need to stay engaged and informed on av issues to be competitive.*







Stephanie L. Sudano, P.E.

NCDOT Multimodal Special Projects Engineer

[ssudano@ncdot.gov](mailto:ssudano@ncdot.gov)

919-707-2611

