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PENNDOT

Connected and Autonomous Vehicles 2040 Vision

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Technologies for Safe and Efficient Transportation

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August 27, 2013

"I have 18-month-old twins. They might not ever drive a car, I think autonomous vehicles are going to happen, and I think PennDOT should embrace that. This is the future of transportation. We need to do the research today."

Secretary Barry Schoch, Pennsylvania Department of Transportation
12th annual Southwestern Pennsylvania Smart Growth Conference
December 2012
Post Gazette

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PennDOT has recently started a project with researchers at Carnegie Mellon University to assess the implications of connected and autonomous vehicles on the state's transportation system.

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Benefits & Challenges

Benefits

- **S**afety
- **A**ccessibility
- **M**obility
- **E**fficiency

Reducing the overall cost of driving:
Time
Fuel
Maintenance
Health - Mortality
Environmental Damages

Challenges

- Technology
- Deployment and Adoption

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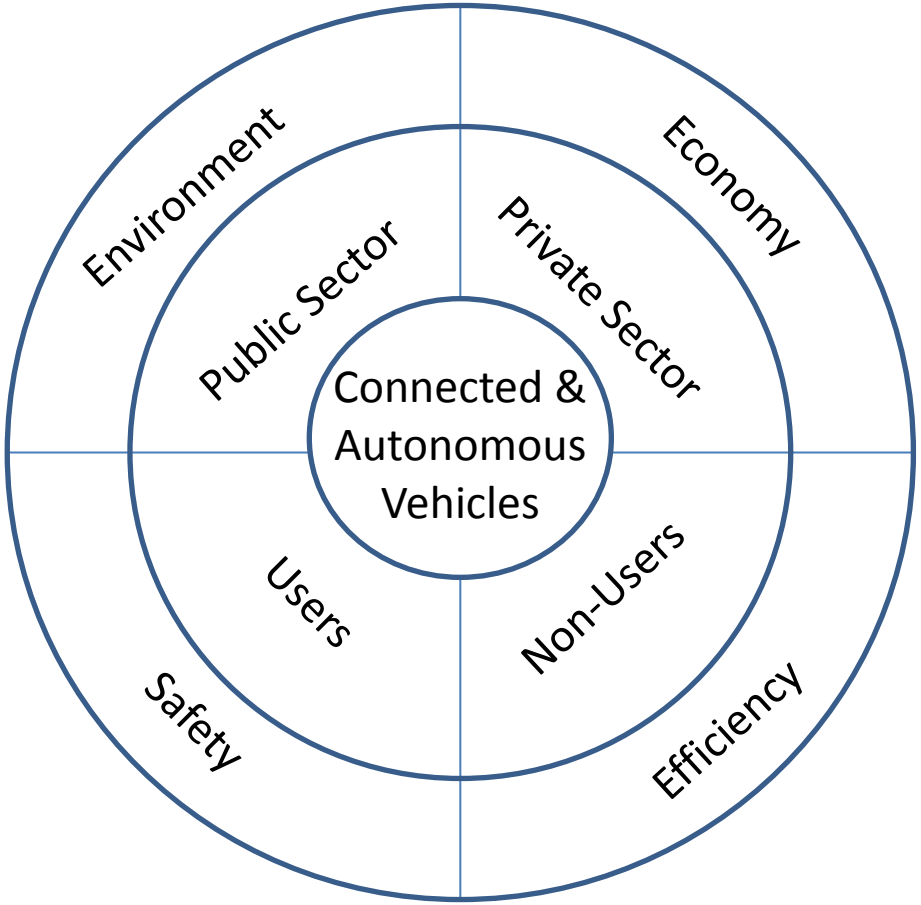
Successful Deployment



Optimizing Benefits while Minimizing Risks

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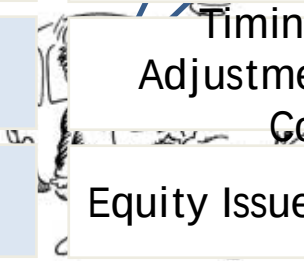
Policy Issues Impacting Successful Deployment

- Liability Issues
  - Insurance policies
  - Types of claims
  - Responsible parties
- Regulatory Issues
  - Standards
  - Signs
  - Education
- Rebound Effects
  - Traffic congestion
  - Lifestyle
  - Environment and Externalities
- Financial Issues
  - Taxes
  - User Fees
- ssues

	Potential Challenges
Autonomous Vehicle Driver	Cost – Perception – Privacy
Standard Vehicle Driver	Perception – Interaction
Auto Manufacturers	Timing & Market Adjustments - Liability Concerns
Society at Large	Equity Issues – Zoning Issues
Government	Regulations – Standards – Finances - Education
Insurance Companies	Pricing Strategies



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Moving Forward …

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Characteristics

- Design Year: 2040
- Boundary: Pittsburgh region
- Timeframe: one year
- Impacts to:
  - Design and Investment Decisions
  - Existing Infrastructure
  - Workforce Training Needs
  - Driver Licensing
  - Communication Devices Investments
  - Impacts to Freight Flow

NHTSA Automation Level	Year(s) to Deploy	Impacts (Cumulative from Level to Level)
Level 0	Zero to five years	- Reduced accident response costs - Additional communication devices required - Altered workforce training - Multi-mode communication of signals and messages - Lane guidance for agency vehicles - Real time traffic flow and condition assessment data available
Level 1	Zero to five years	- Increasingly safer vehicle flows. - Roadway capacity increases due to adaptive cruise control, advanced braking and lane guidance (e.g. tunnel bottlenecks) - Multi-mode communication of signals and messages - Reduced clear zone needs due to lane guidance and advanced braking. - Possibility of more extensive shoulder driving.
Level 2	Zero to ten years	- Incremental improvements in safety and roadway capacity (e.g. merging and weaving warnings, wrong way travel disabled) - Opportunity for segregated, managed lanes for different traffic flows (e.g. small vehicles, freight)

NHTSA Automation Level	Year(s) to Deploy	Impacts (Cumulative from Level to Level)
Level 3	10+ years	- New driver licensing categories - Incremental improvements in safety and roadway capacity (e.g. merging and weaving aids) - Possibility of vehicle platooning in managed lanes.
Level 4	15+ years	- Messaging and signals become virtual. - Incremental improvements in safety and roadway capacity (e.g. extensive platooning) - Increased travel with non-driver trips and lower trip disutility. - Driverless transit and trucks, with possibility of savings resulting in lower axle weights.

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" A business like an automobile, has to be driven in order to get results."

B.C. Forbes

Editor & Founder of Forbess Magazine (1917)

Thank You

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