AUTONOMOUS VEHICLES

Implications for Planning

by Ryan Snyder

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AUTONOMOUS VEHICLE FUTURE

Problems Solved or Auto-Dystopia

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LEVELS OF AV TECHNOLOGY

LEVEL 0
human-driver does everything

LEVEL 1
vehicle assists with certain functions

LEVEL 2
vehicle does some driving, human monitors environment

LEVEL 3
vehicle drives/monitors, but human takes over when required

LEVEL 4
full self-driving automation only in certain environments

LEVEL 5
full self-driving automation all the time

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STATE OF THE ART
Human Error Crashes

93%

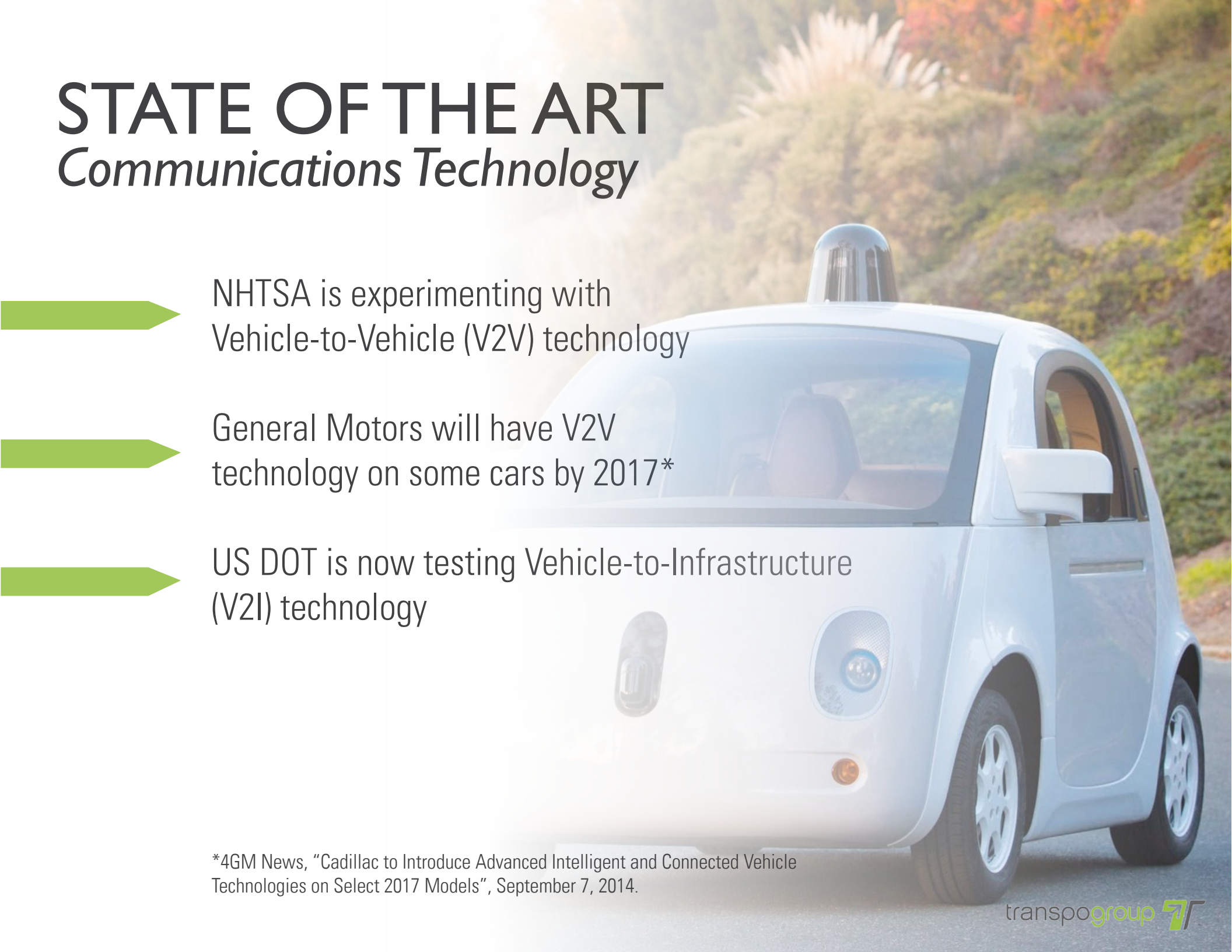
of crashes are caused by
HUMAN ERROR

- **1** fatality per **18.55** million miles driven**
- **1** injury crash per **637,000** miles driven**

Google has had **1** crash per **125,000** miles driven; no report on injuries/ fatalities; none the fault of the car

*2NHTSA, National Motor Vehicle Crash Causation Survey, DOT HS 811 059, July 2008.
**3NHTSA Traffic Safety Facts, December 2014.

STATE OF THE ART
Communications Technology



- NHTSA is experimenting with Vehicle-to-Vehicle (V2V) technology
- General Motors will have V2V technology on some cars by 2017*
- US DOT is now testing Vehicle-to-Infrastructure (V2I) technology

*4GM News, "Cadillac to Introduce Advanced Intelligent and Connected Vehicle Technologies on Select 2017 Models", September 7, 2014.

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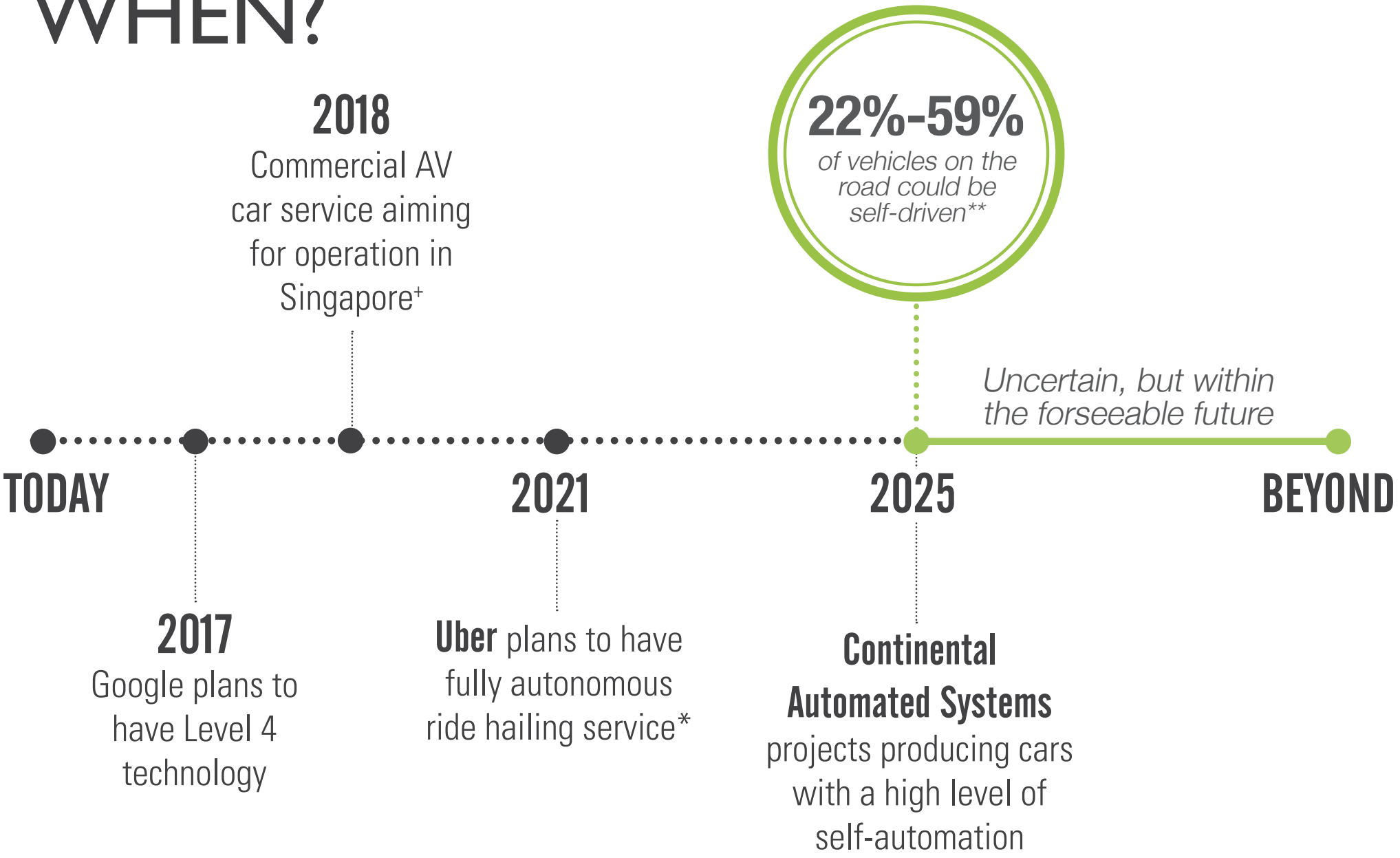
WHEN?



* Jonathan Berr, Moneywatch CBS News, "Uber's Audacious Plan to Replace Human Drivers", August 25, 2016

**Jerome Lutin, Alain Komhauser, Eva Lerner- Lam, "The Revolutionary Development of Self-Driving Vehicles and Implications for the Transportation Engineering Profession", Institute of Transportation Engineers Journal, July 2013.

+ nuTonomy Blog, Sept 23, 2016

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ECONOMICS

58 cents/mile to drive an average car*

= **$725/month**

With carsharing, roughly less than 72 hours/month better than owning ($10/hour)

Cost of transit bus drivers **54%** of operating costs**

At some point is it cheaper to take "driverless Uber pool" than to own.

Then why own a car?

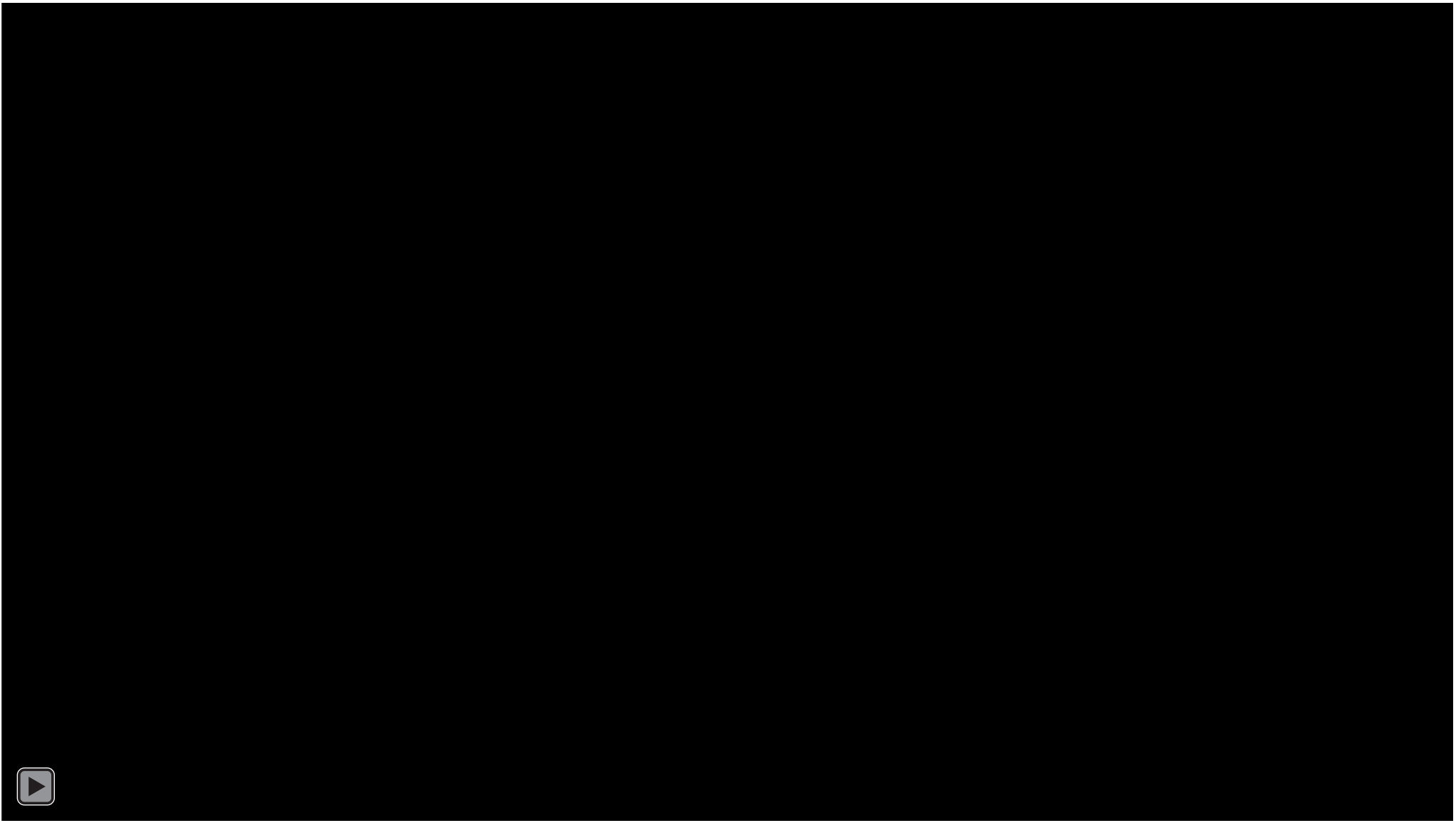
*"Your Driving Costs 2015", American Automobile Association
**American Public Transit Association, 2013 Public Transit Fact Book, p. 26.

POTENTIAL BENEFITS
User Conveniences

- Mobility for those who don't drive
- Better use of time
- Less stress
- Deliveries
- Select an appropriate vehicle for the trip

TECHNOLOGICAL CAPABILITIES

Increased Capacity



POTENTIAL BENEFITS

Capacity & better use of streets

- Roughly double
- Less congestion
- More opportunities for road diets

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POTENTIAL BENEFITS

Capacity & better use of streets

Before

After

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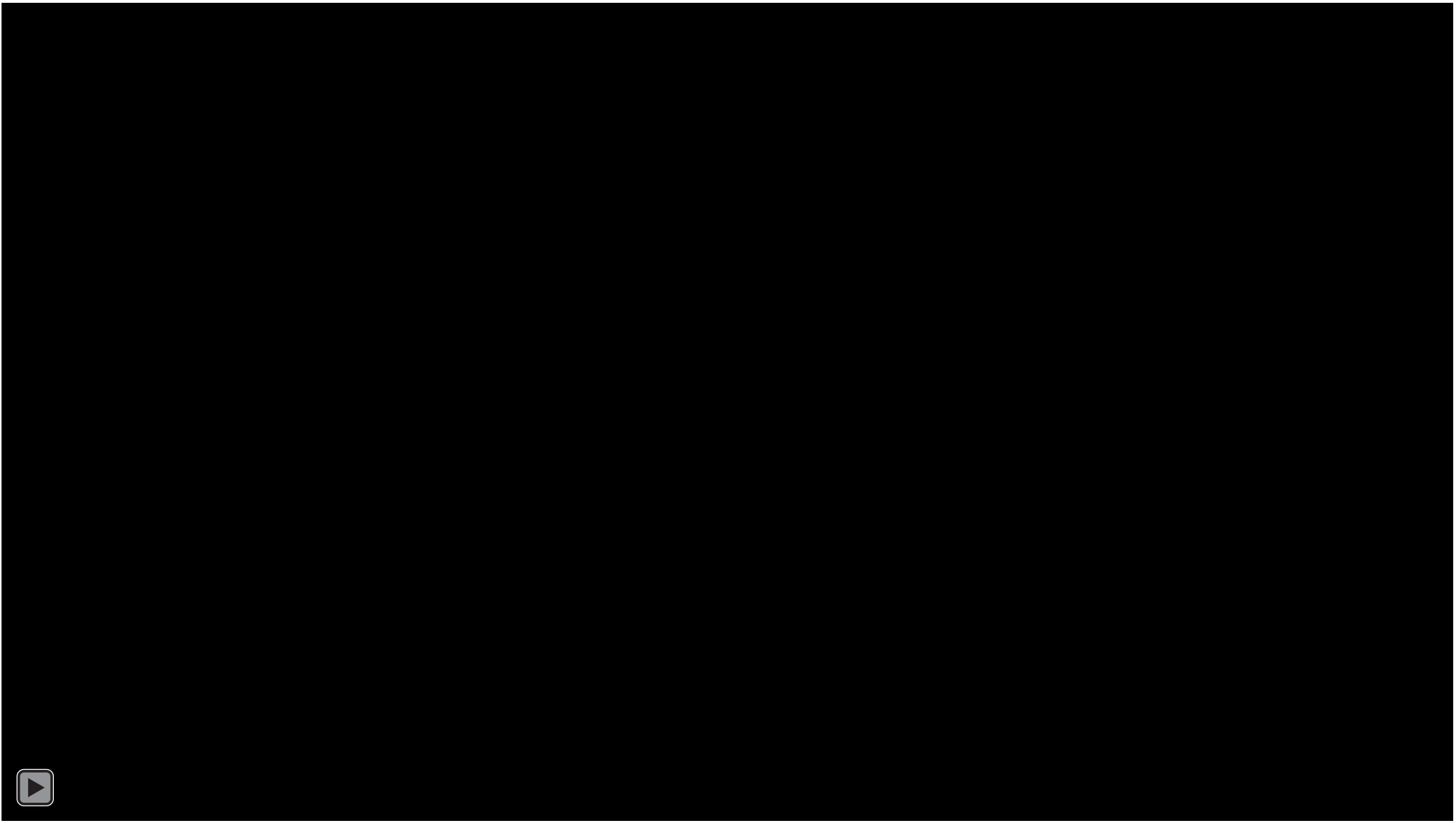
TECHNOLOGICAL CAPABILITIES

Repurposing Space in Our Streets



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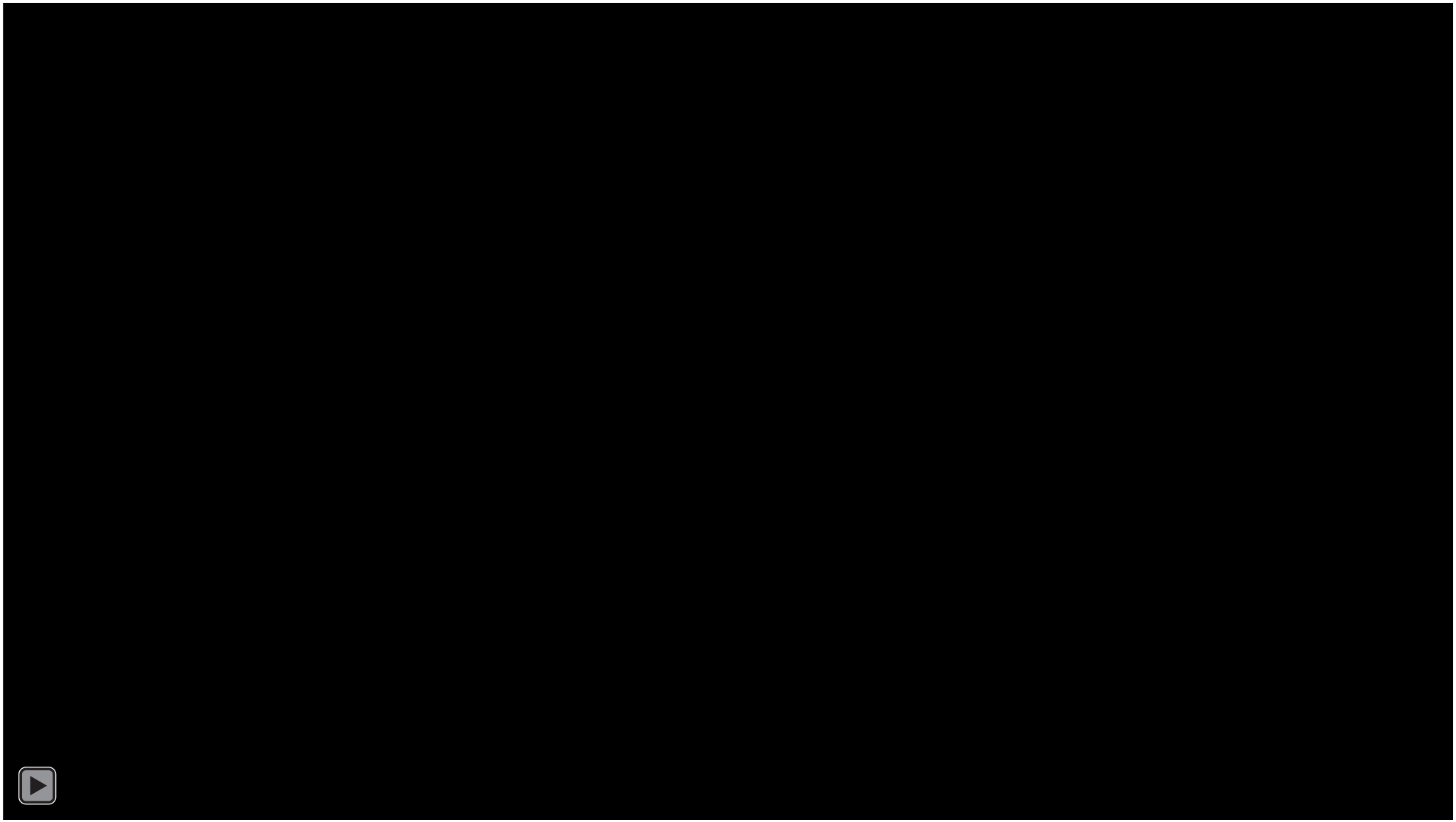
TECHNOLOGICAL CAPABILITIES

Optimized Traffic Flow



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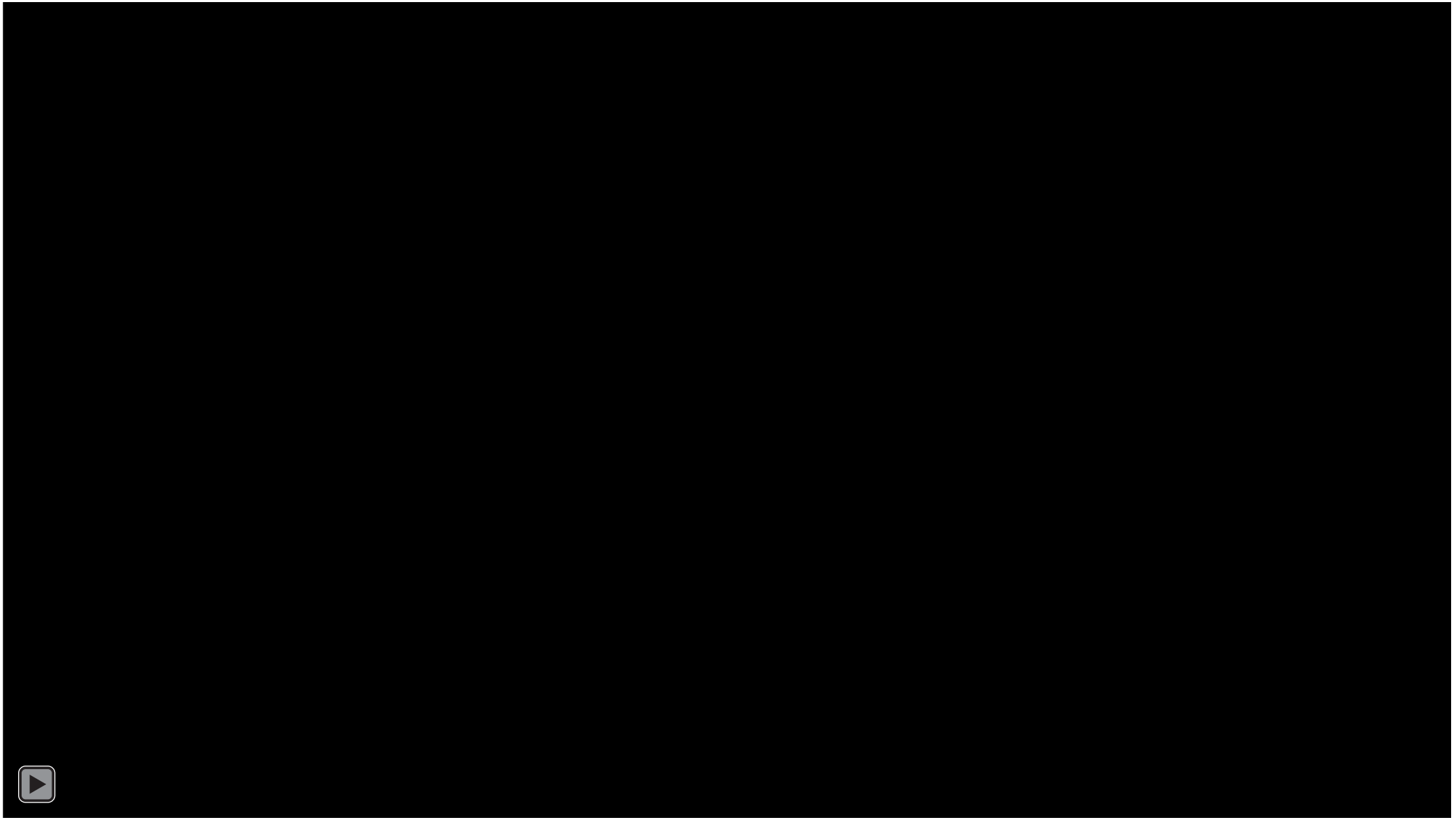
TECHNOLOGICAL CAPABILITIES

Lane Clearance for Priority Vehicles



TRANSIT BENEFITS

- Feeder Service
- Increased service
- Faster service
- New viable ridesharing services
- Possibility of high-speed buses

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GREATER USE OF MICRO TRANSIT

Source: www.gizmodo.com

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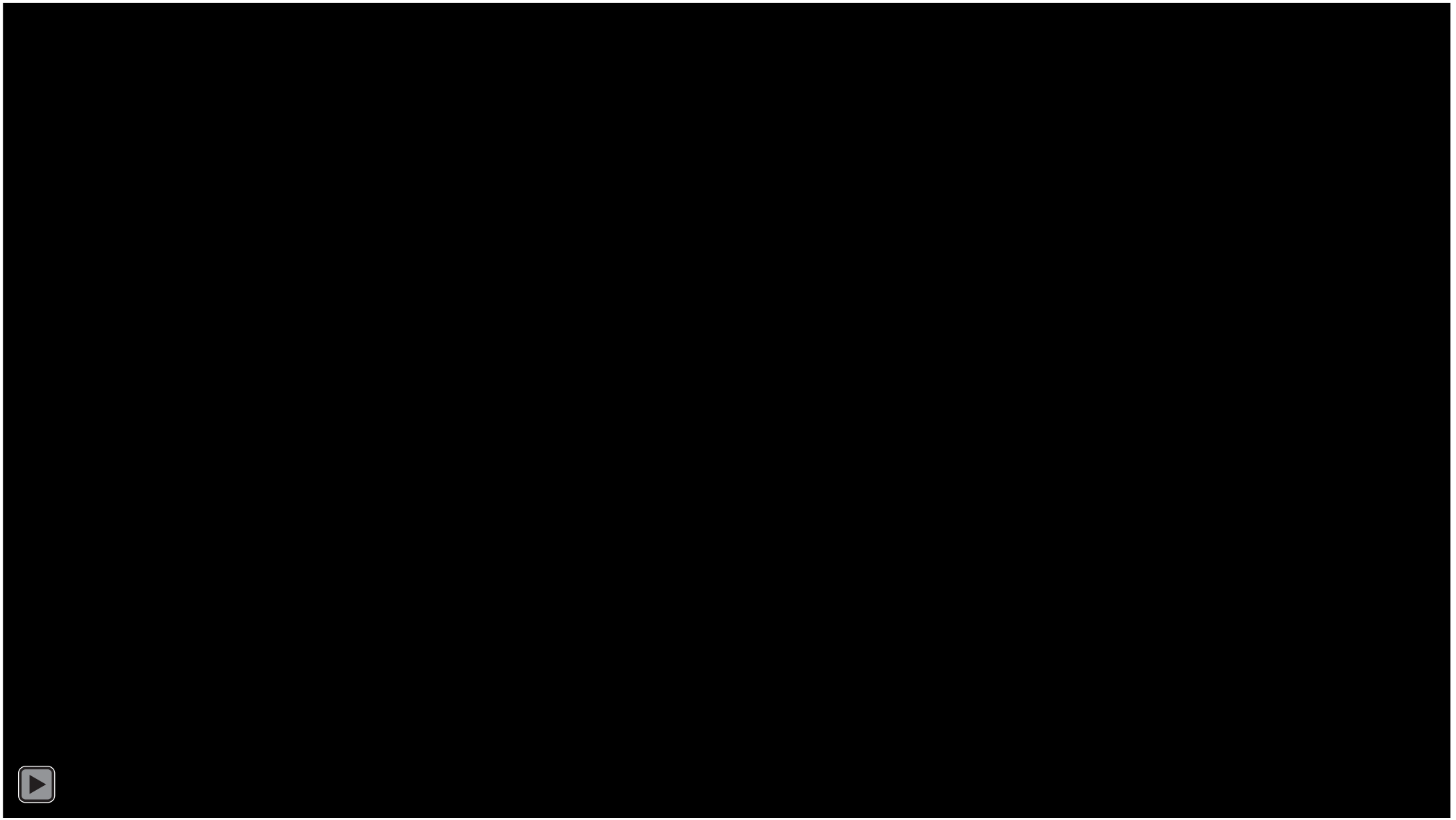
TECHNOLOGICAL CAPABILITIES

High-Speed Buses



TECHNOLOGICAL CAPABILITIES

Long distance high-speed bus

TECHNOLOGICAL POSSIBILITIES

Enhanced detection of pedestrians and bicycles

RURAL CONTEXT

- Likely more user-owned
- Possible new micro-transit services
- New ridesharing services
- Likely later roll out than urban areas

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REPLACING PARKING LOTS/ STRUCTURES

GREATER USE OF ELECTRIC VEHICLES

Source: www.alll-electric-vehicles.com

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POTENTIAL BENEFITS
FASTER Emergency ACCESS

- Less congestion to drive in
- With lane clearance, emergency vehicles could have priority

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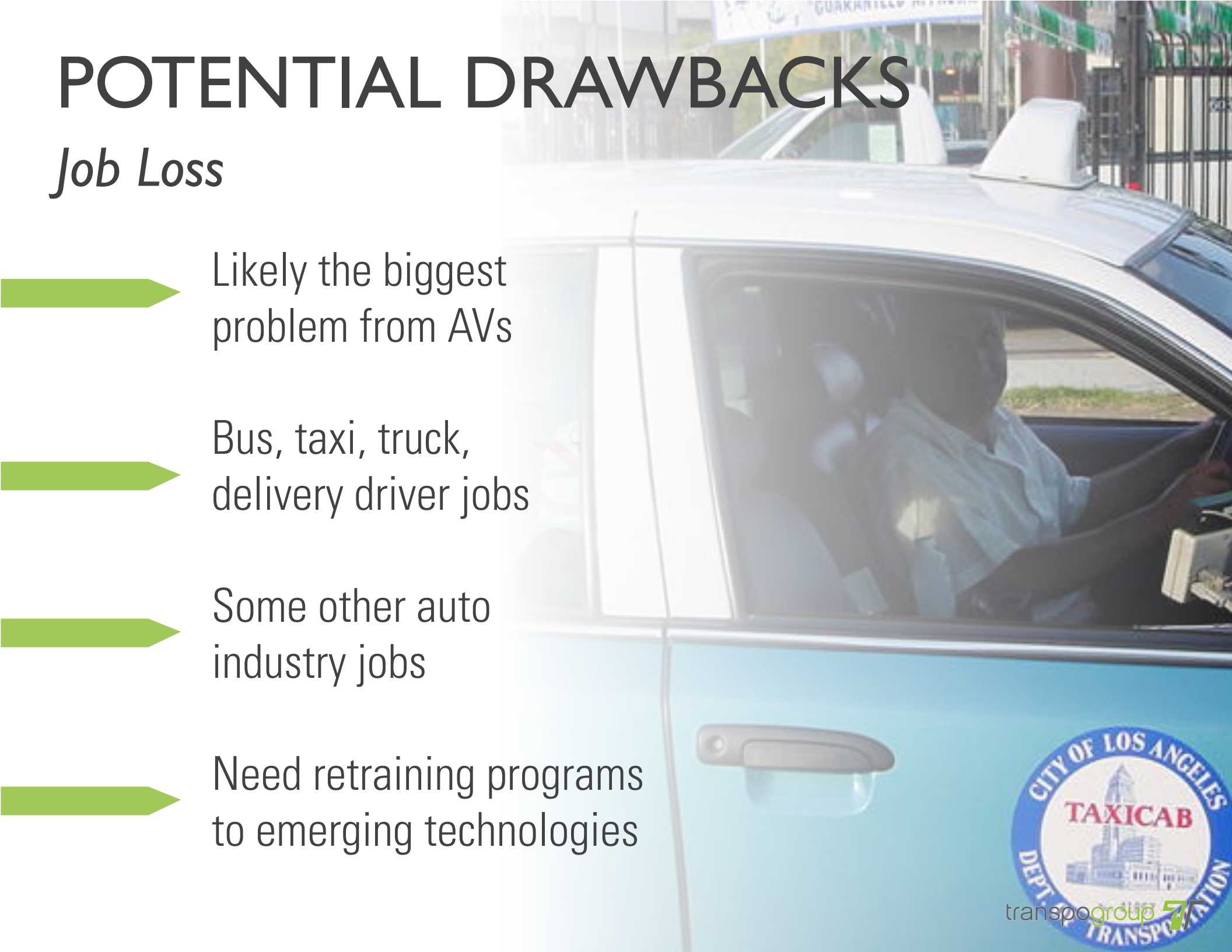
POTENTIAL DRAWBACKS

Job Loss

- Likely the biggest problem from AVs
- Bus, taxi, truck, delivery driver jobs
- Some other auto industry jobs
- Need retraining programs to emerging technologies



POTENTIAL DRAWBACKS

Encouraging driving and longer commutes

- Better use of time not driving
- No stress
- Reduces "cost" of driving
- Enact policies to encourage efficient travel

POLITICS OF ALGORITHMS

Determining Priority

- Private companies might start lobbying for control
- Prioritize multi-occupant vehicles over single-occupant cars
- Ped/Bike priorities
- System needs to reflect good policy over politics

POLICIES

- Decide where AVs can operate during transition
- Equipment requirements
- Revisit the issue of a requirement for the driver
- Research & Development

POLICIES

- Pricing strategies
- Give time advantages
- Liability issues
- MUTCD issues
- Parking codes

photo cred: AUVSI


photo cred: Volvo

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CONCLUSIONS

- AVs offer many potential benefits
- Policy can and should speed AV
- Policy should ensure beneficial outcomes
- We should change assumption in today's decisions

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