



The Future of Roads

Collaborating for Industry Solutions in the Built Environment (CISBE) Symposium

The future?

**“It's tough to make predictions,
especially about the future”**

– Yogi Berra

**Looking for evidence of future
change**

- Trends
- Technologies
- Business models



Transport industry expecting disruption



“I think there’s going to be more change in the next five to ten years than there’s been in the last 50”

– General Motors CEO Mary Barra



“It is clear we are on the cusp of a revolution in mobility, from carsharing to autonomous driving to the customer experience”

– Former Ford CEO Mark Fields

Dual purpose roads?



Electric Vehicles



What's the fuss about electric vehicles?

Why electric?	Why not?
Performance	Price
Zero tailpipe emissions <ul style="list-style-type: none"> - Increasingly stringent emissions targets - Improves air quality - Reduces carbon emissions 	Range & anxiety
Running costs <ul style="list-style-type: none"> - Cheaper to fuel (potentially zero) - Cheaper to maintain (Tesla Model S has 18 moving parts, compared to around 2,000 with petrol/diesel engine) 	Lack of charging infrastructure



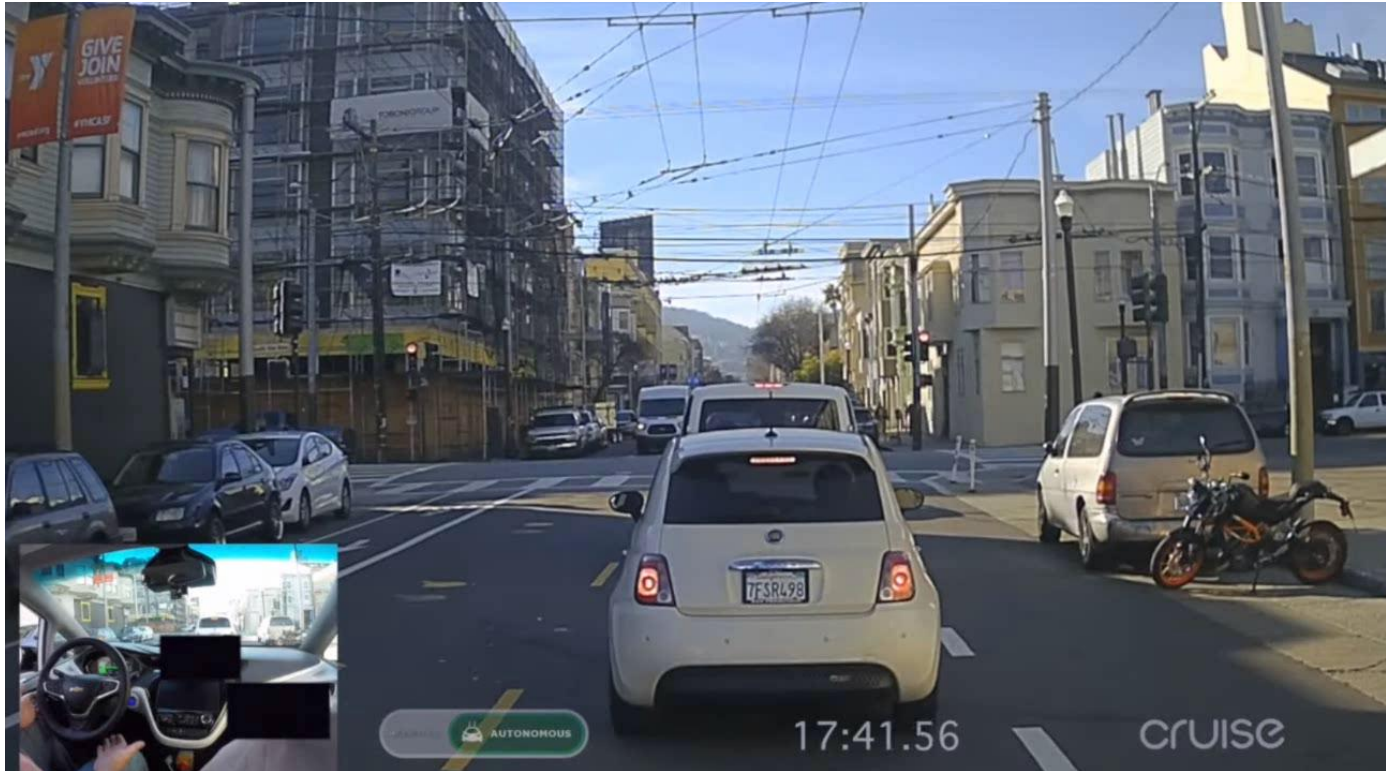
What's happening?

- Auto manufacturers are moving to electric vehicles:
 - “General Motors believes in an all-electric future”
Mark Reuss, General Motors
 - GM releasing 20 new electric vehicles by 2030
 - Tens of billions of investment in EV manufacturing
- Countries and cities outlining plans to ban Internal Combustion Engines (ICE):
 - Norway 2025
 - Paris 2030
 - UK & France 2040

Automated Vehicles



Driverless - What's the current capability?



- [Cruise Automation's demo video](#) in San Francisco, February 2017

Waymo (Google) – the leader?

- Driven over 3.5 million autonomous miles
- Invested US\$1.1 billion between 2009 & 2015
- Disengagements of system
 - 1 every 2,000 km in 2015
 - 1 every 8,000 km in 2016
- ‘Early Rider’ program now testing with real people in Phoenix



Transport as a Service



- [Cruise Automation employee ride sharing service](#)

How quickly can things change?



Spot the car

New York, 5th Avenue 1900



Spot the horse

New York, 5th Avenue 1913

Other technologies

- Hyperloop
 - Intercity transport
- Autonomous passenger drones (electric flying cars)
 - UberElevate
 - Dubai to launch shuttle service using Volocopter
 - Daimler investing in Volocopter
 - Airbus has released their own concept vehicle
- Autonomy in Infrastructure Construction?

