TRANSFUTURE

Innovate the Future of Transportation

FDOT

Sneak Preview

June 26, 2017

Future Starts Now

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Autonomous & Connected Vehicles

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- Five-fold roadway capacity increase
- 90% + reduction in crashes
- New driving experience

Shared Mobility

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- Potential to reduce fleet size by 90 percent
- Shared auto-ownership impacts
- Internet of things – big data

UBER

lyft

Smart Cities

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- Endless possibilities for a connected future

Science or Fiction?

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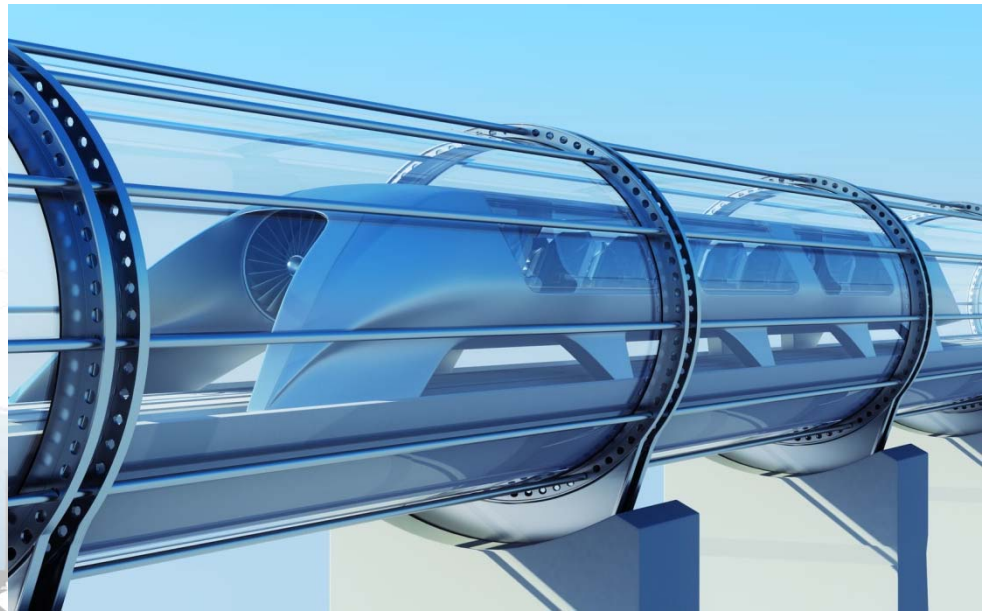
Straddling Bus ▲ ▼ Transit X

Helium Airships ▲ ▼ Hyperloop



Science or Fiction?

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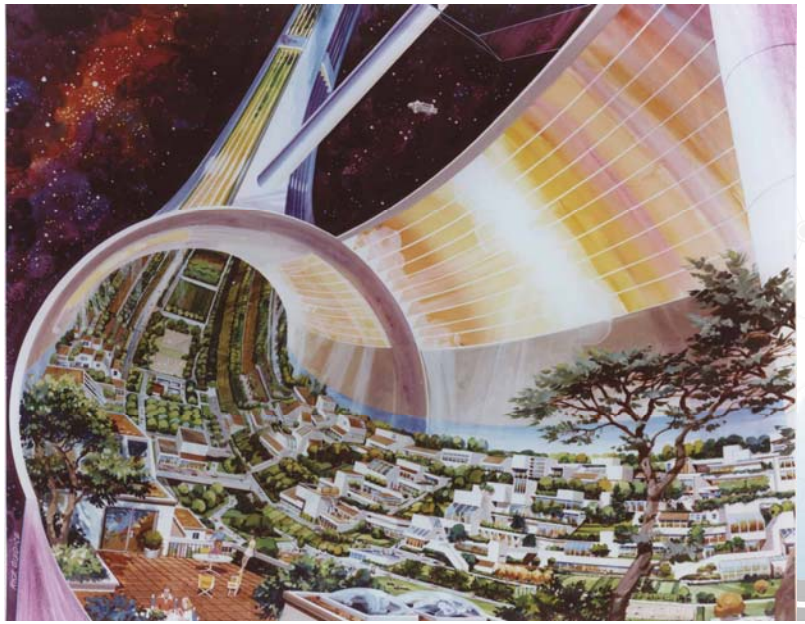
Drone Hub ▲ ▼ Space Colony



Space Tourism – Vacation of the Future ▼

Transformation is Real

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Sorting Facts from Fiction

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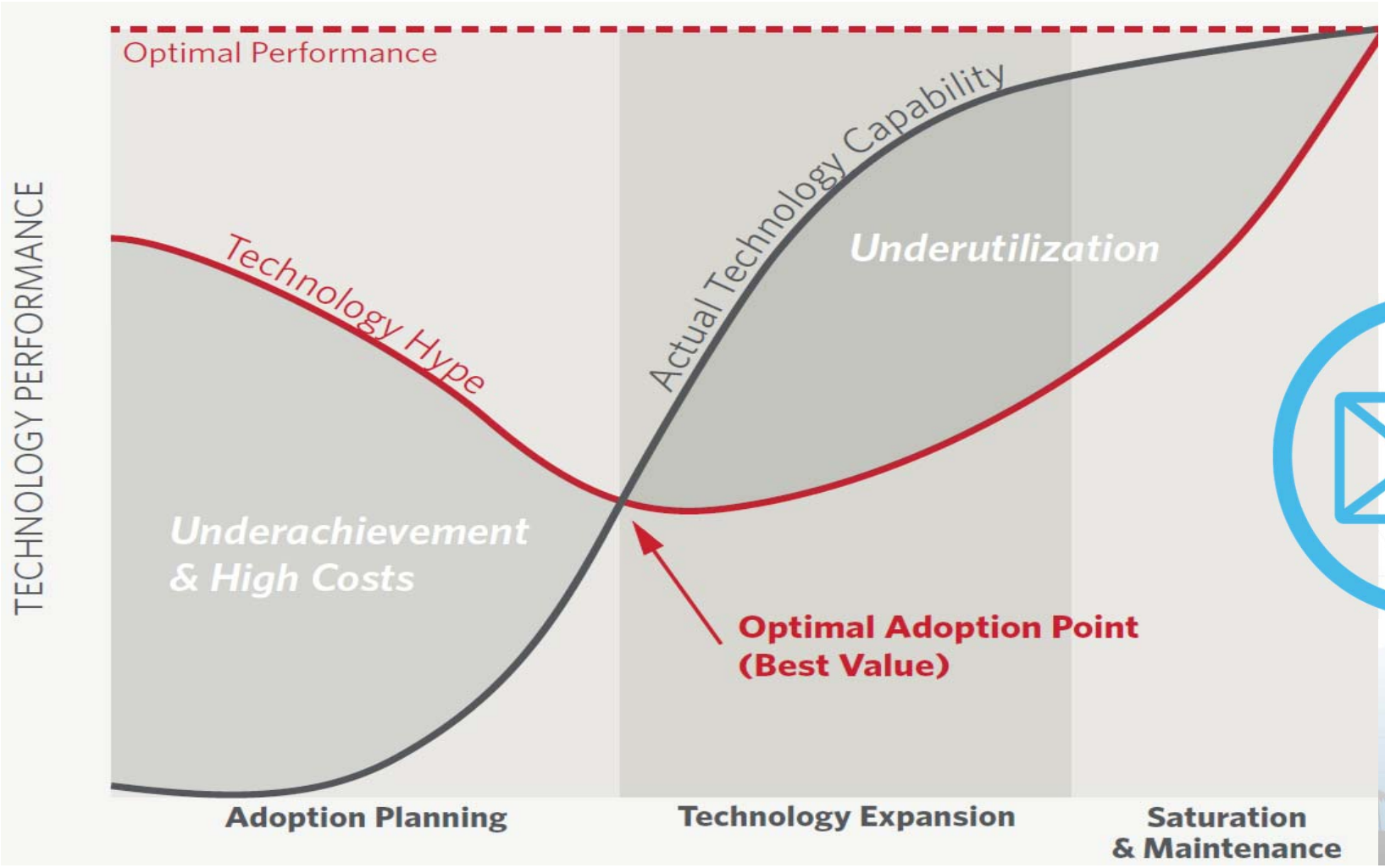
- Optimal adoption point for best value
- Cutting edge vs. bleeding edge



Why Now?

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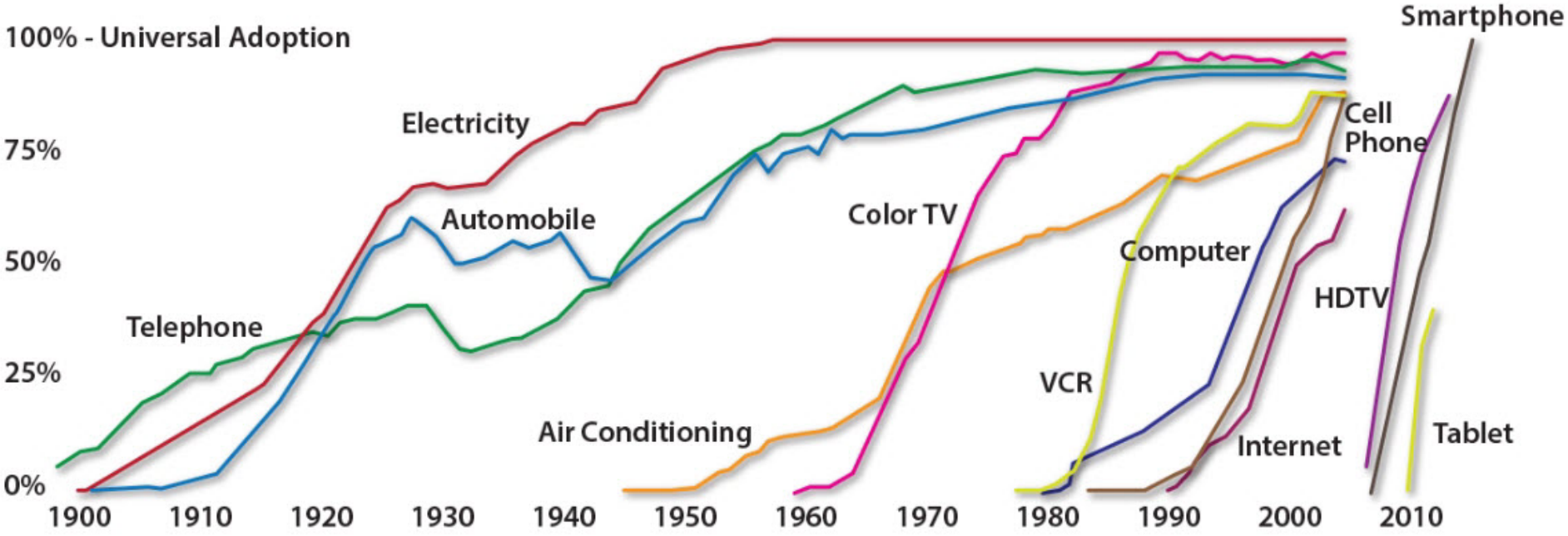
- Moore's law – computing power doubles every 2 years



Market Readiness

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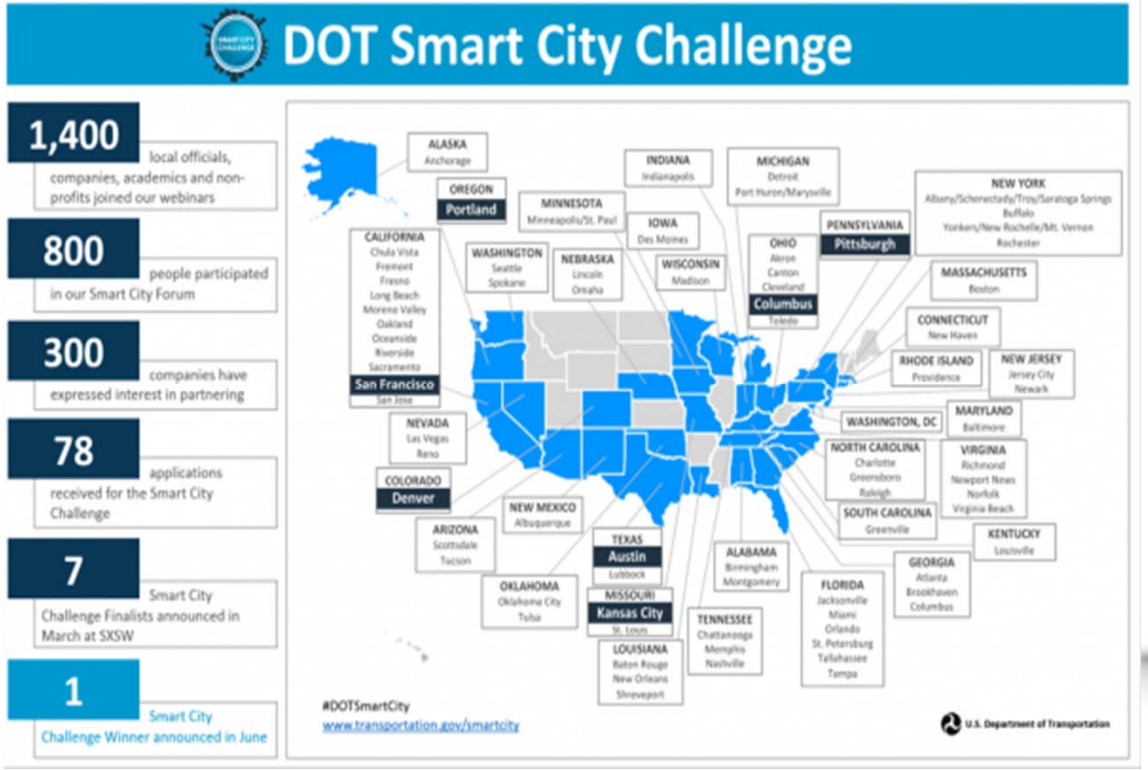
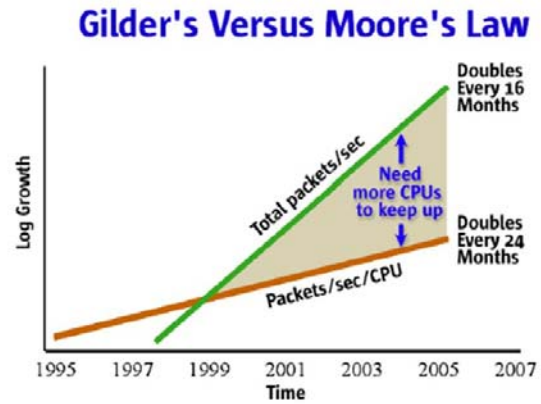
- 78 cities participated in Smart Cities challenge
- 34 States enacted autonomous vehicle legislation since 2012
- Most new vehicles sold today have advanced features





Source: The Net Effect

Market Readiness

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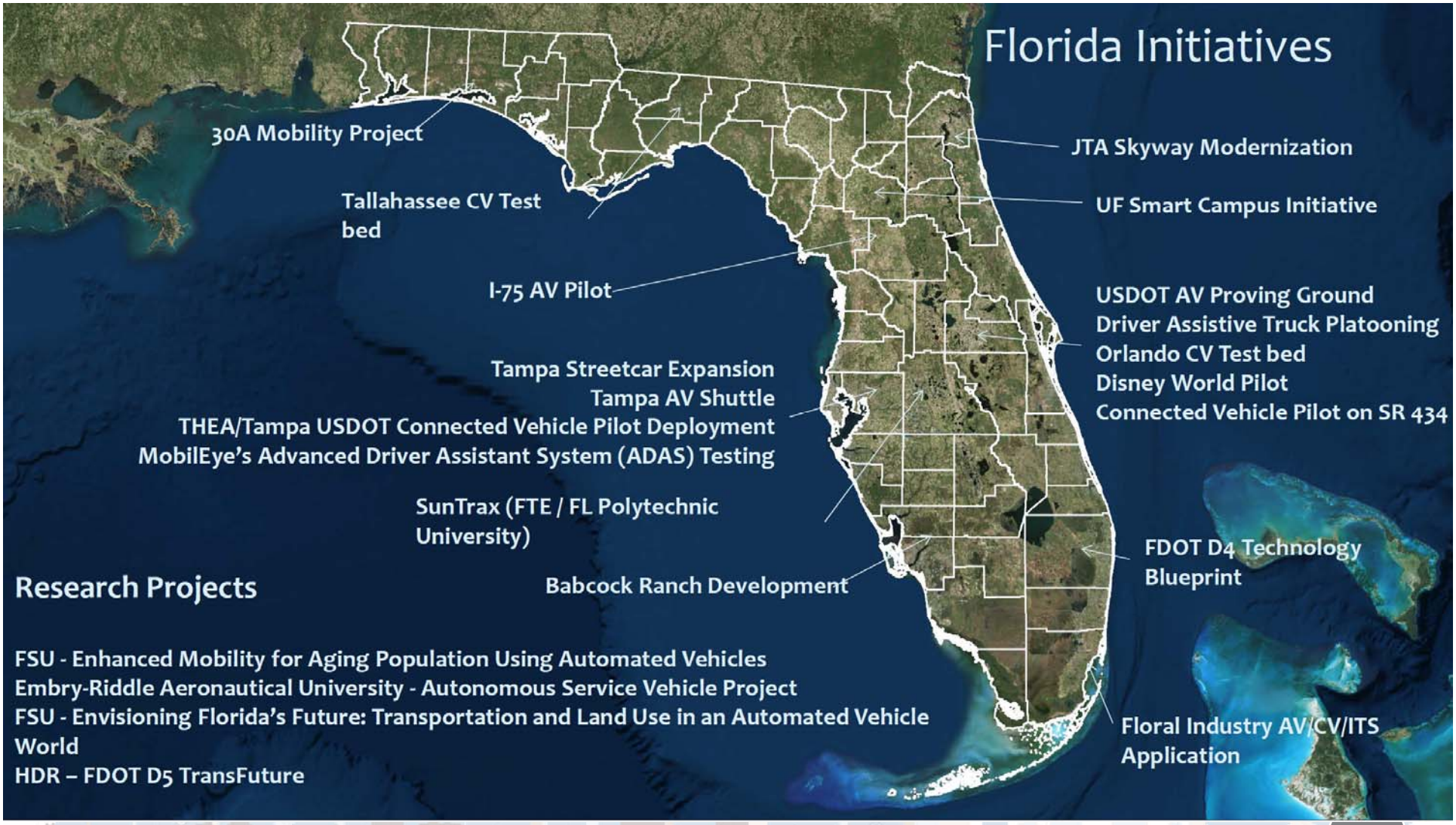

Research Projects

FSU - Enhanced Mobility for Aging Population Using Automated Vehicles
Embry-Riddle Aeronautical University - Autonomous Service Vehicle Project
FSU - Envisioning Florida's Future: Transportation and Land Use in an Automated Vehicle World
HDR – FDOT D5 TransFuture

Decision Making Challenge

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- Traditional tools and methods are falling short of answering policy questions of tomorrow
- How to prepare for the unknown?

Introducing TransFuture

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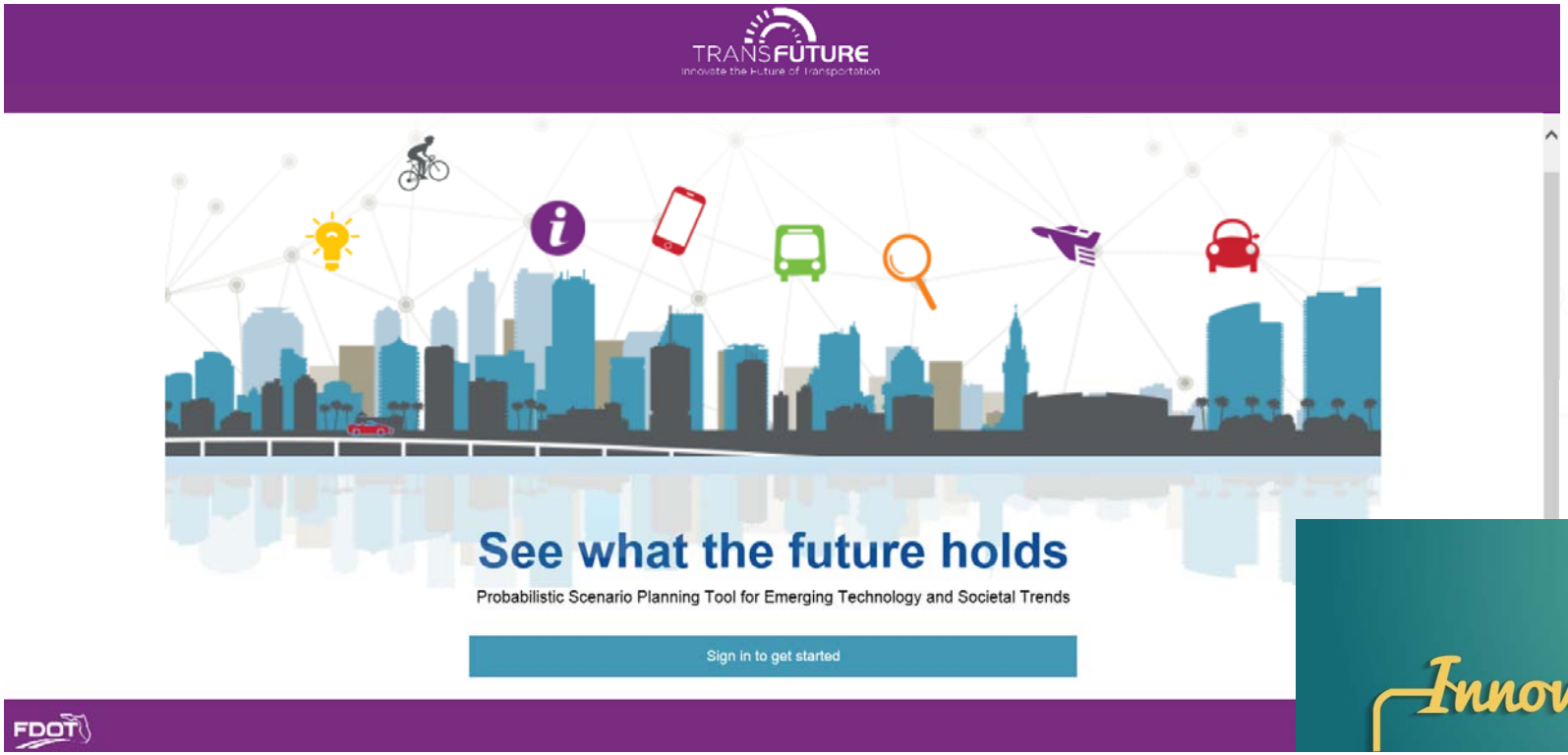
- Next-gen scenario planning tool
- Prepare for multiple futures
- Explicitly account for uncertainty
- Support a desirable future by incorporating flexibility
- Add-on lens to improve decision-making



Planning for Multiple Futures

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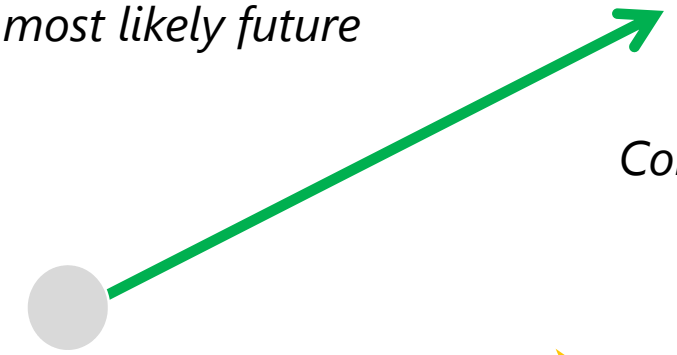
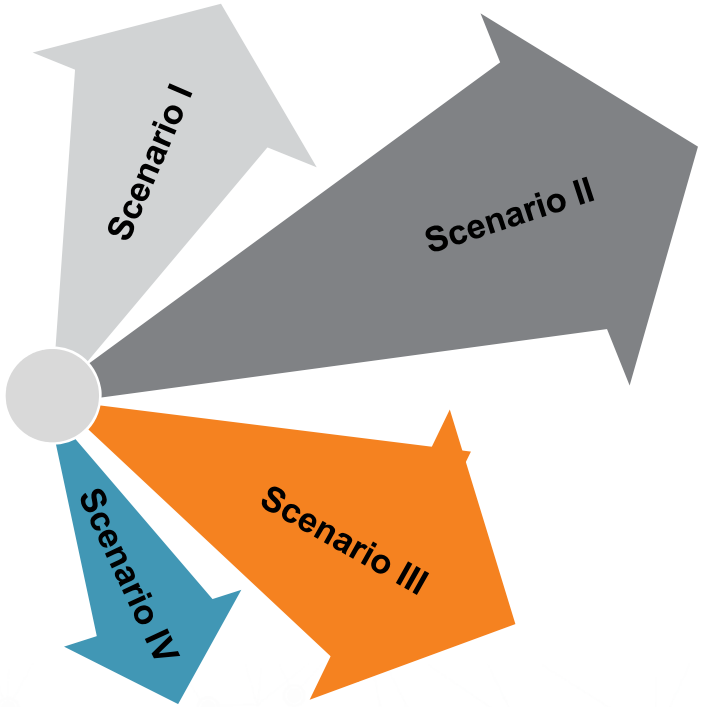
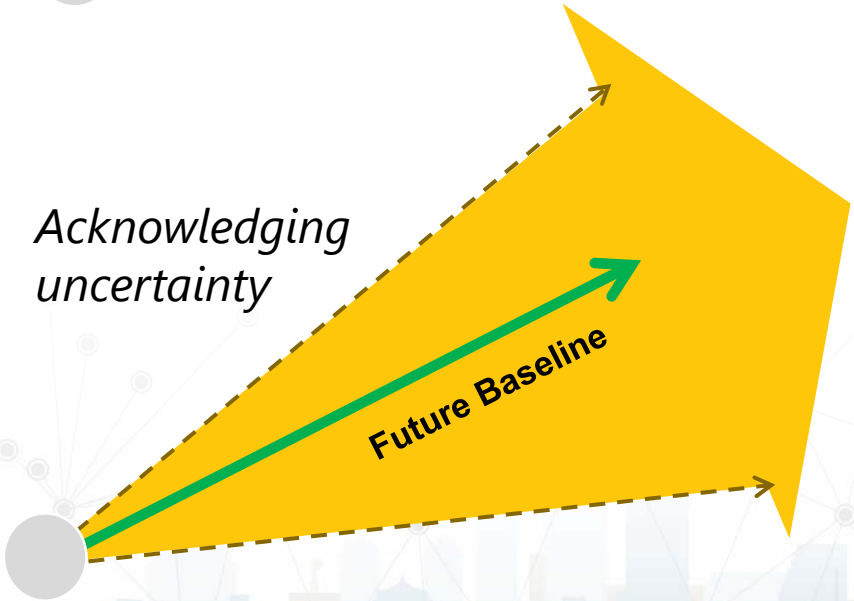
Traditional planning for most likely future



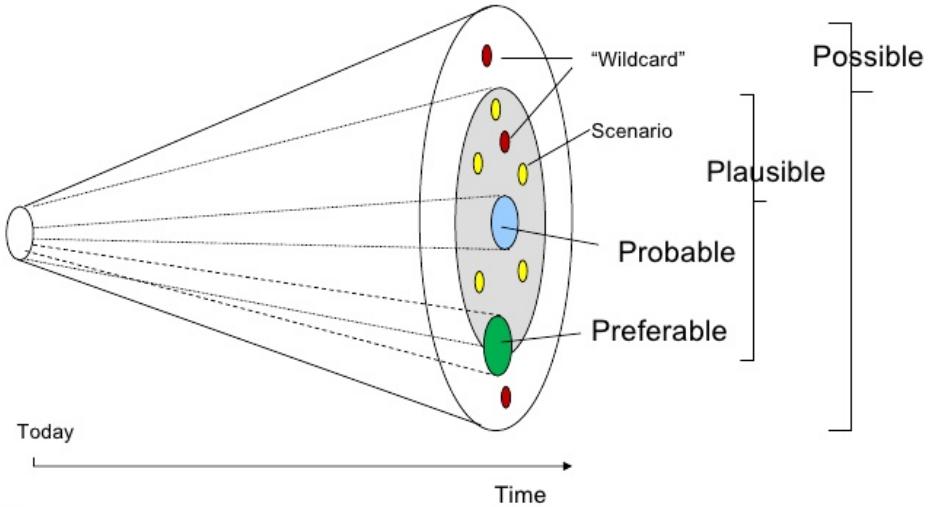
Considering multiple futures and uncertainties



Acknowledging uncertainty



Composite Uncertainty Cone



Development Approach

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Identify Trends

Quantify Trends

Deterministic to Probabilistic

Understand Uncertainties

Make Informed Decisions

Implementation Plan

Emerging Trends

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Changing Demographics	Improved Technology	Shifting User Preferences	Improved Travel Options
• Millennial travel behavior • Aging population • Generation Z	• Automated vehicles • EVs • Workplace automation • Improved user information & navigation • Smart City	• Urbanization • Shift from individual ownership to fleet ownership • Telecommuting • E-commerce & delivery options	• Better walking and biking options • Improved public transit • Shared mobility

Sample Literature

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- Autonomous Vehicle Implementation Predictions – VTPI
- NCHRP Report 750, Informing Transportation's Future – TRB
- Preparing a Nation for Autonomous Vehicles – Eno Center
- Shared Mobility and the Transformation of Public Transit - APTA
- Millennials & Mobility: Understanding the Millennial Mindset – APTA
- City of the Future – National League of Cities
- Shared Mobility and the Transformation of Public Transit – APTA
- Evaluating Carsharing Benefits – VTPI
- Planning for an Uncertain Future: Using Scenario Planning to Add Clarity When the Future Is Unclear - TRB

Automated Vehicles

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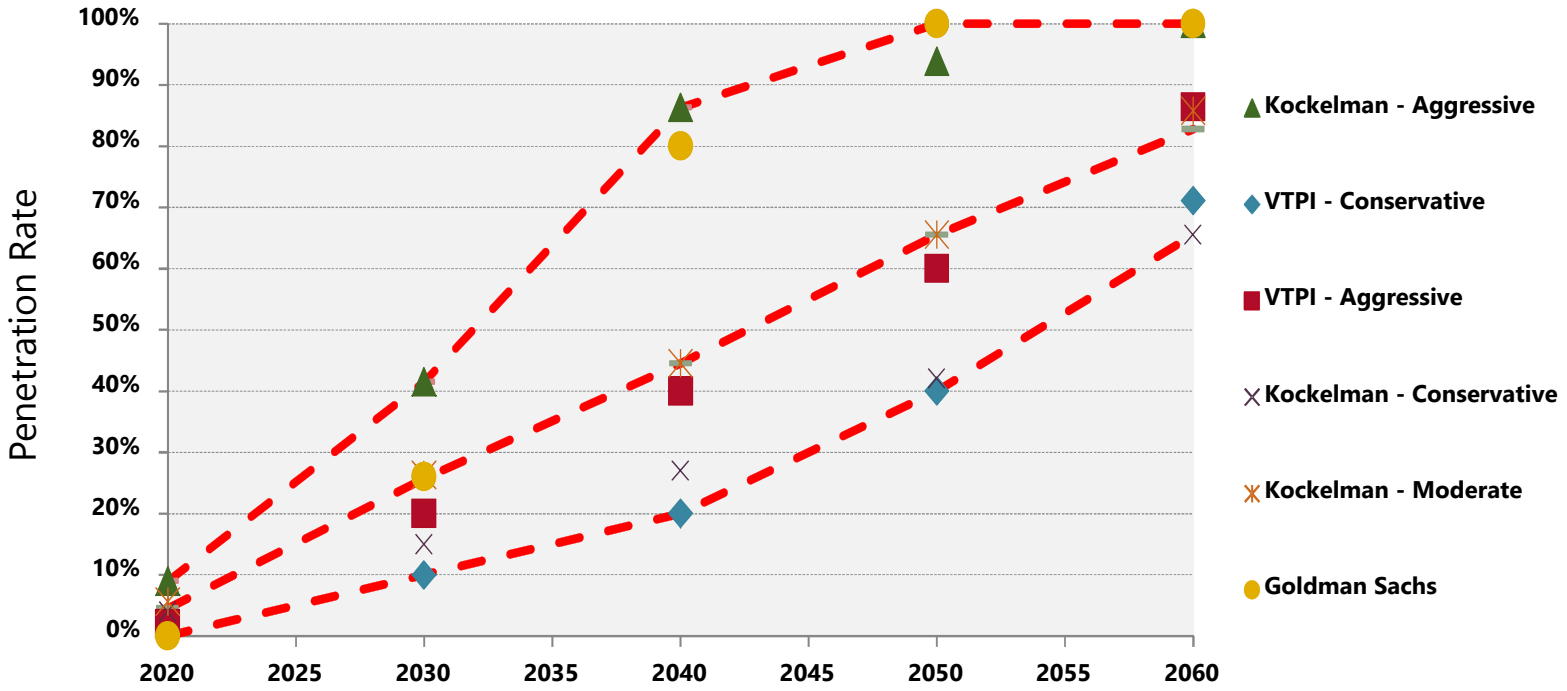
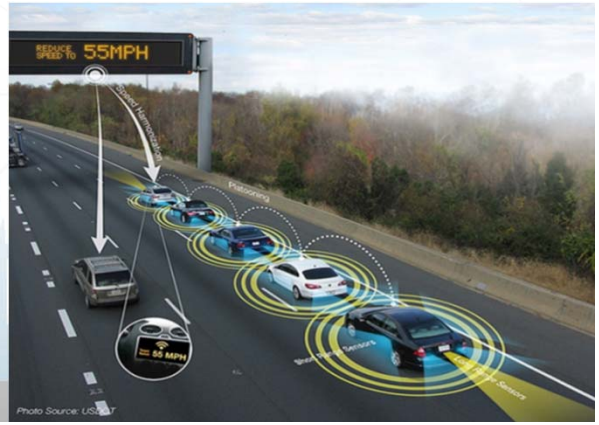
- Capacity and demand increase



Market penetration

Early adoption - trucks?

Connected features in cars



Shared Mobility

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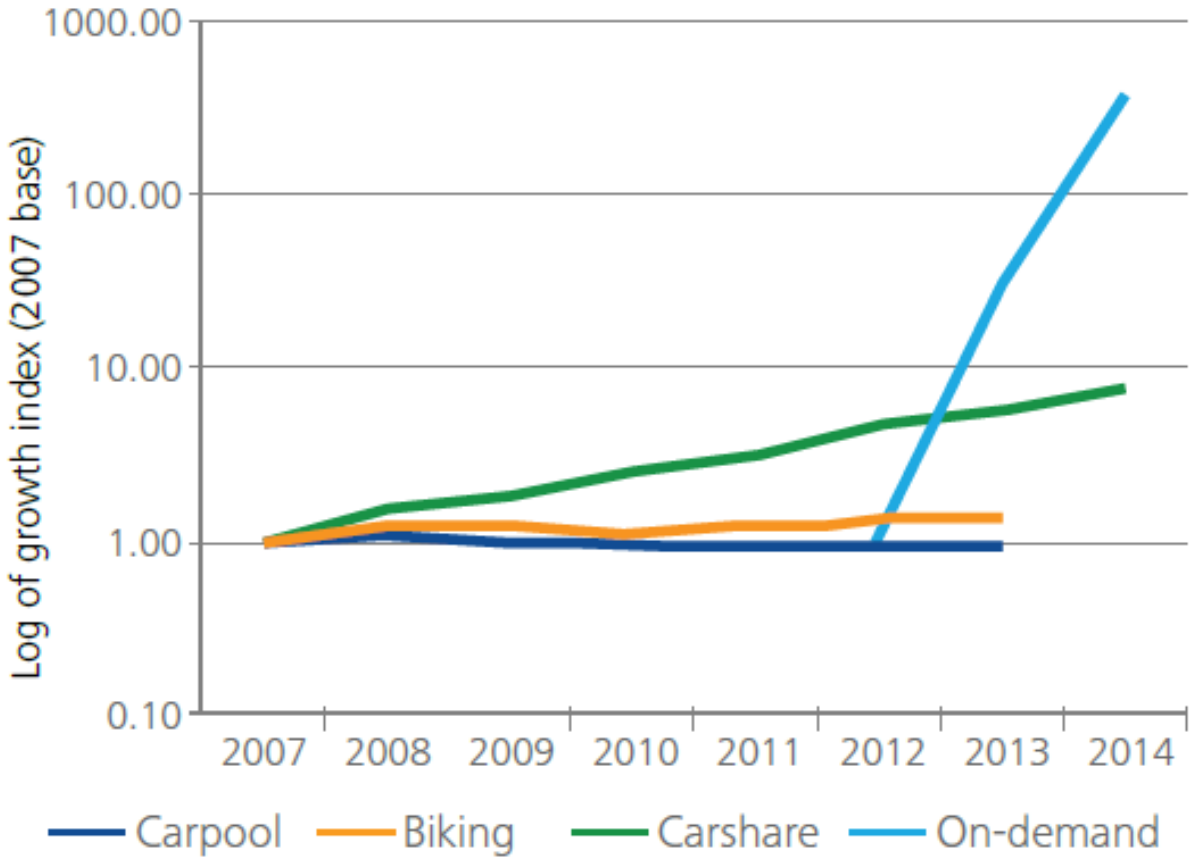
- Reduction in auto ownership
- Potential increase in trips
- Fleet size reduction



Workplace Automation

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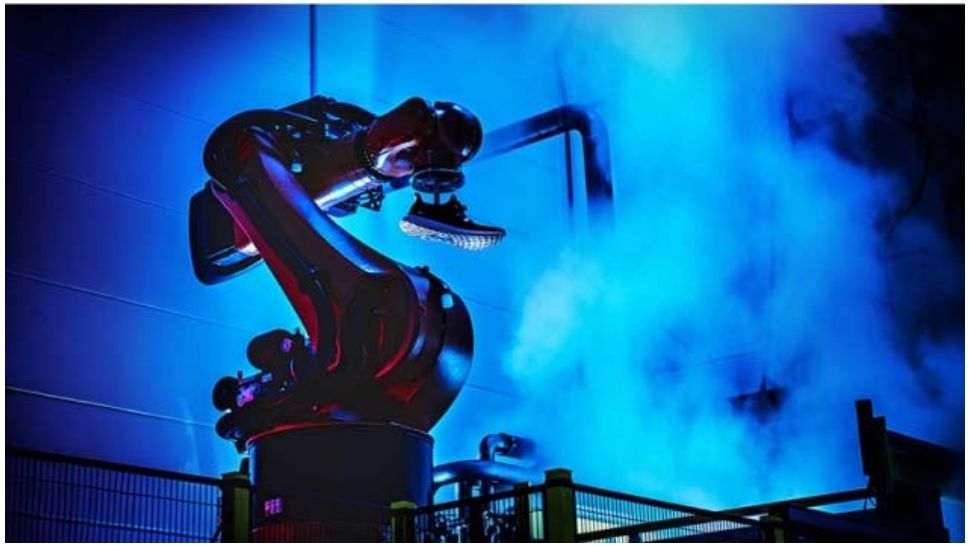
- Jobs at risk for automation
- Transformation of the labor force
- Jobs of Generation Z (1995-today)



Conceptual Framework

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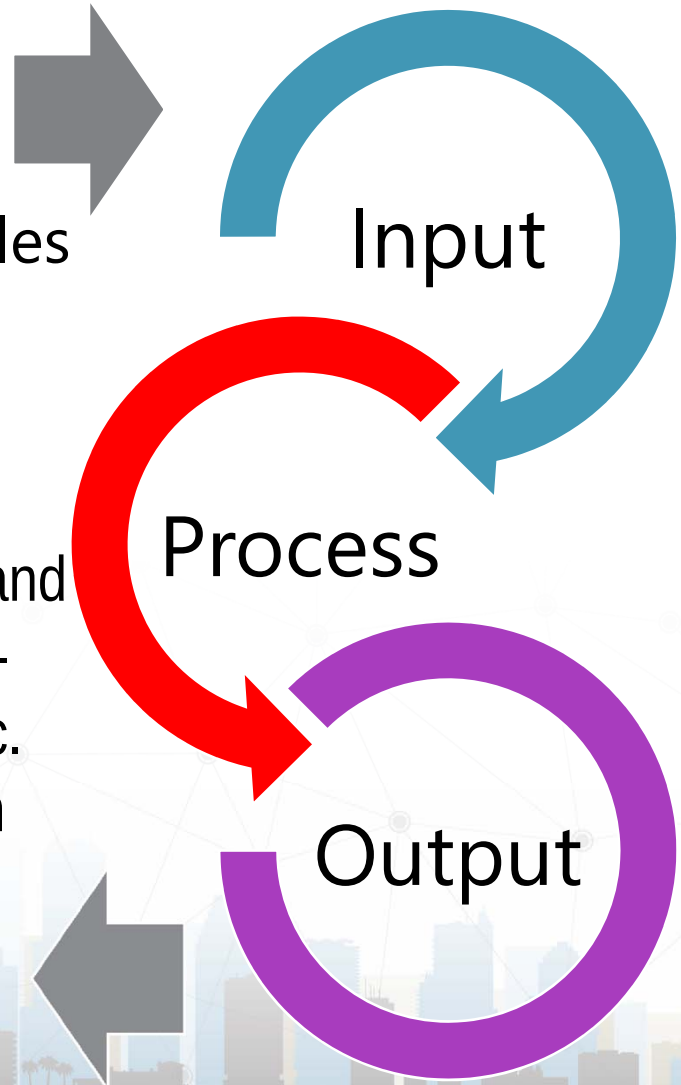
Frontend

- Regional travel demand model files
- Define scenarios

Backend

- Regression analysis
- Elasticity analysis
- Monte Carlo Simulation



- Probabilistic results and confidence intervals - AADT, VMT, VHT, etc.
- Scenario comparison
- Facility footprint

Methodology Framework

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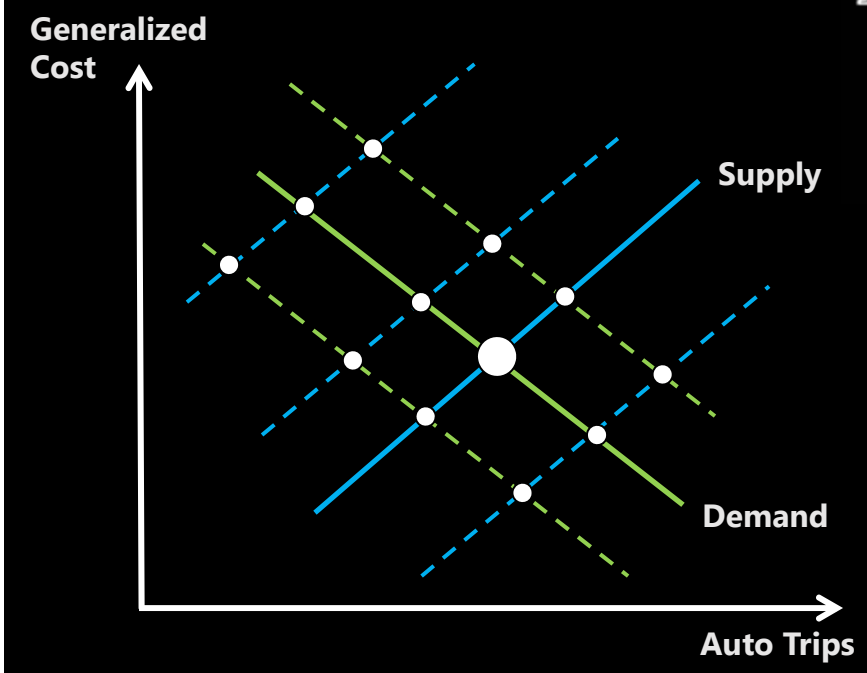

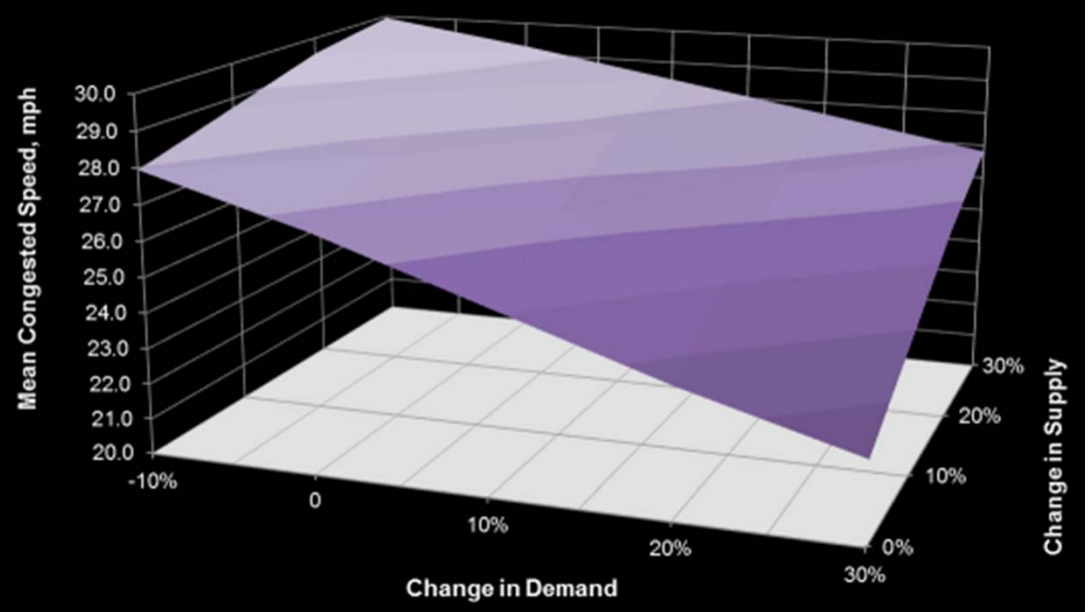

- N-dimensional supply-demand surface
- Quantifying impacts of emerging trends

Accounting for Uncertainty

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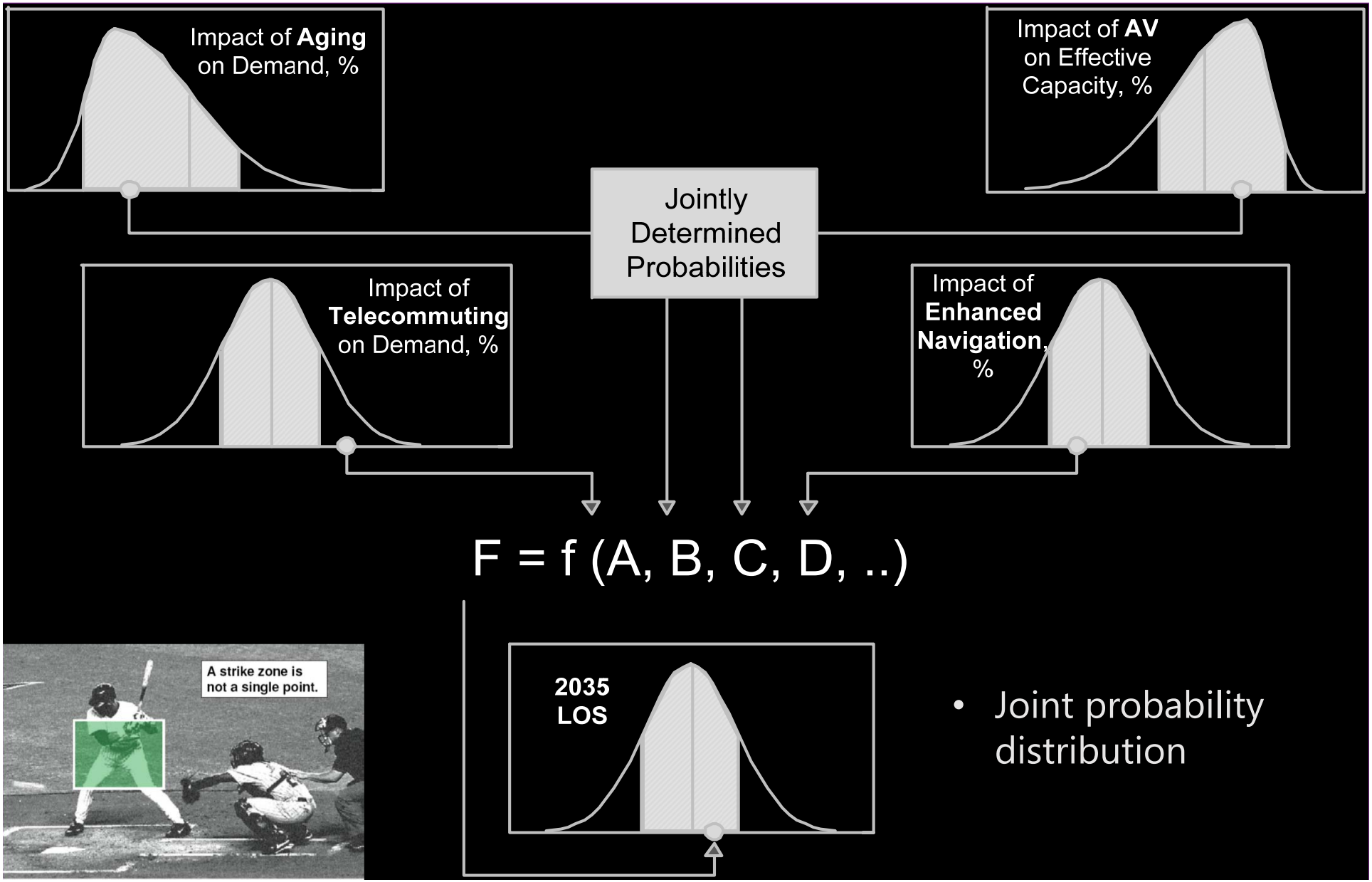

- Joint probability distribution

Hypothetical Corridor Analysis

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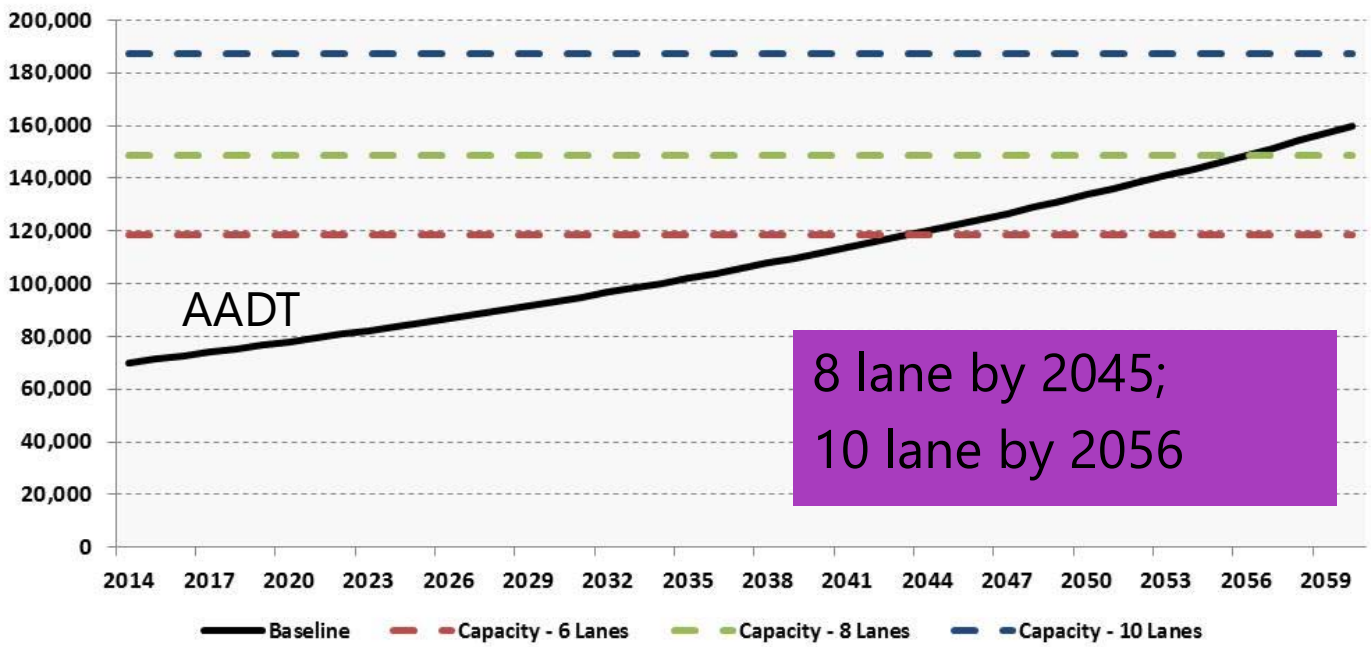
Baseline Scenario



10-lane capacity

8-lane capacity

6-lane capacity

Hypothetical Corridor Analysis

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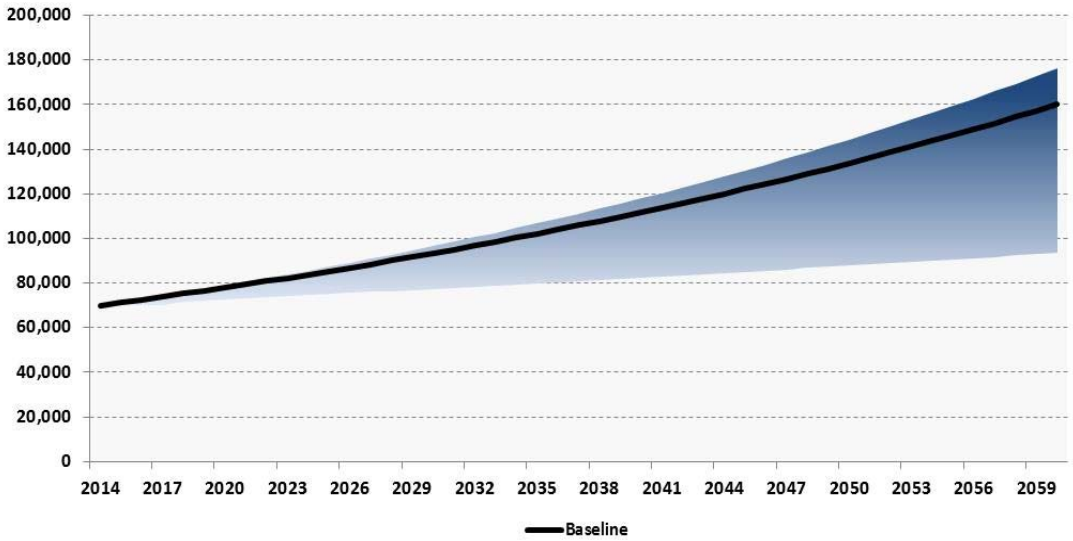
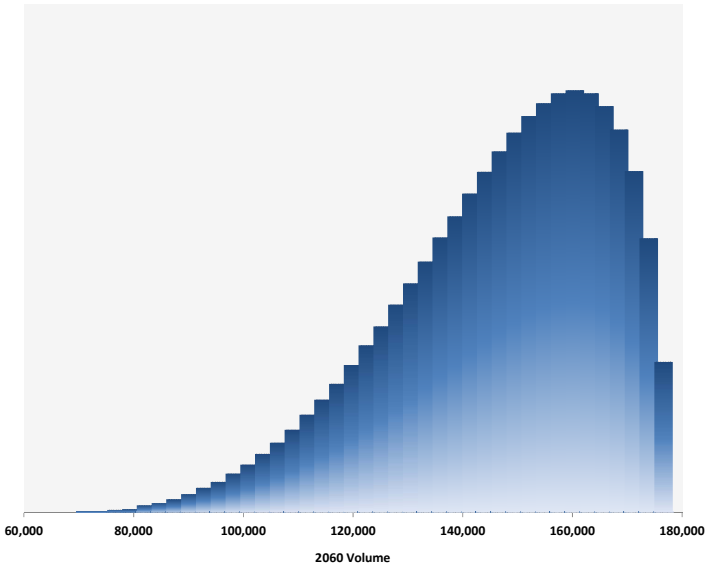
Build Scenario



AV/ CV Market penetration = 2035 – 10%; 2060 – 50%



Two emerging trends considered:
Aging population - Reduced demand
Automated vehicles - Capacity increase, Demand increase

Hypothetical Corridor Analysis

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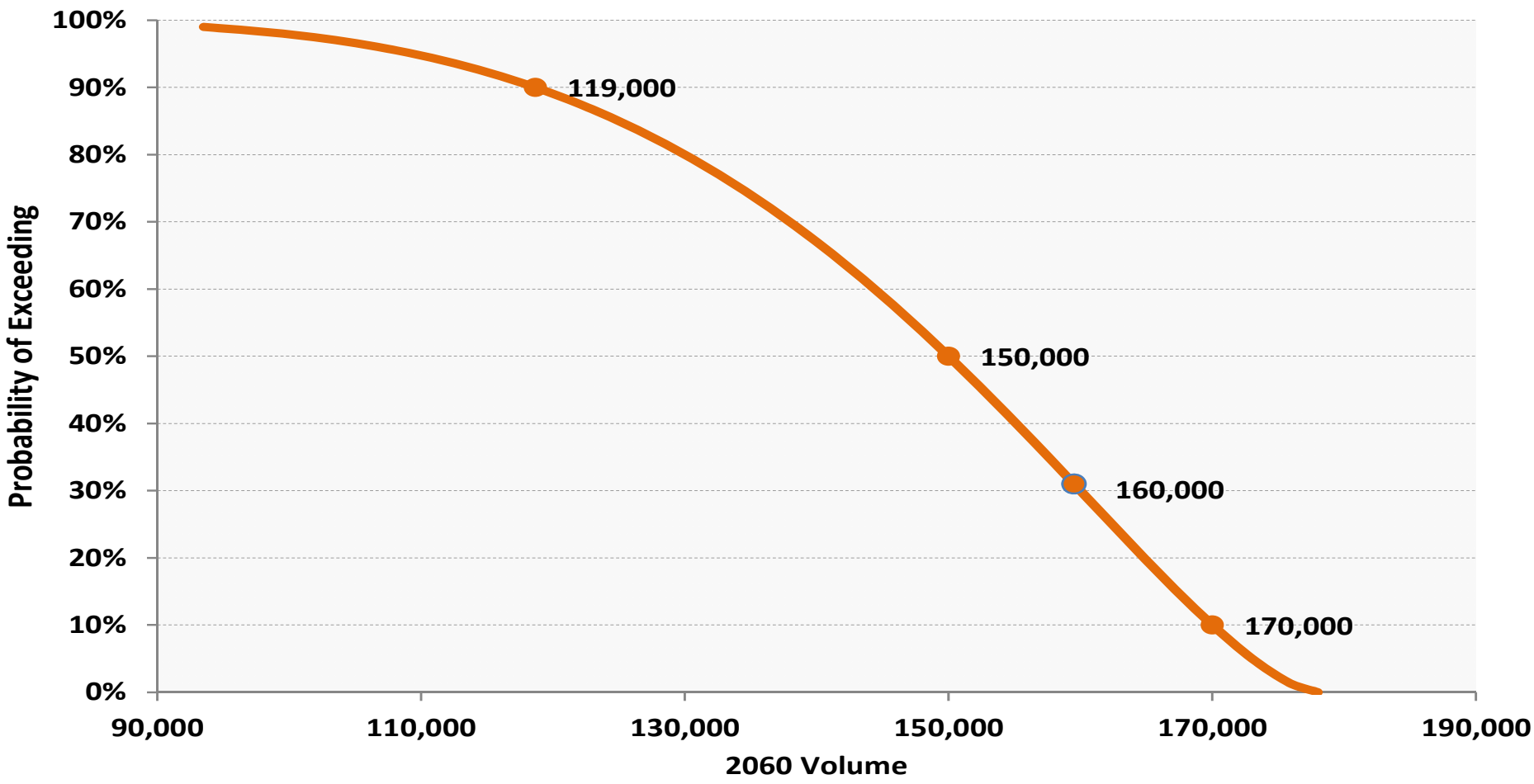
Build Scenario

- We are 90% confident that the 2060 AADT will be <170,000



Hypothetical Corridor Analysis

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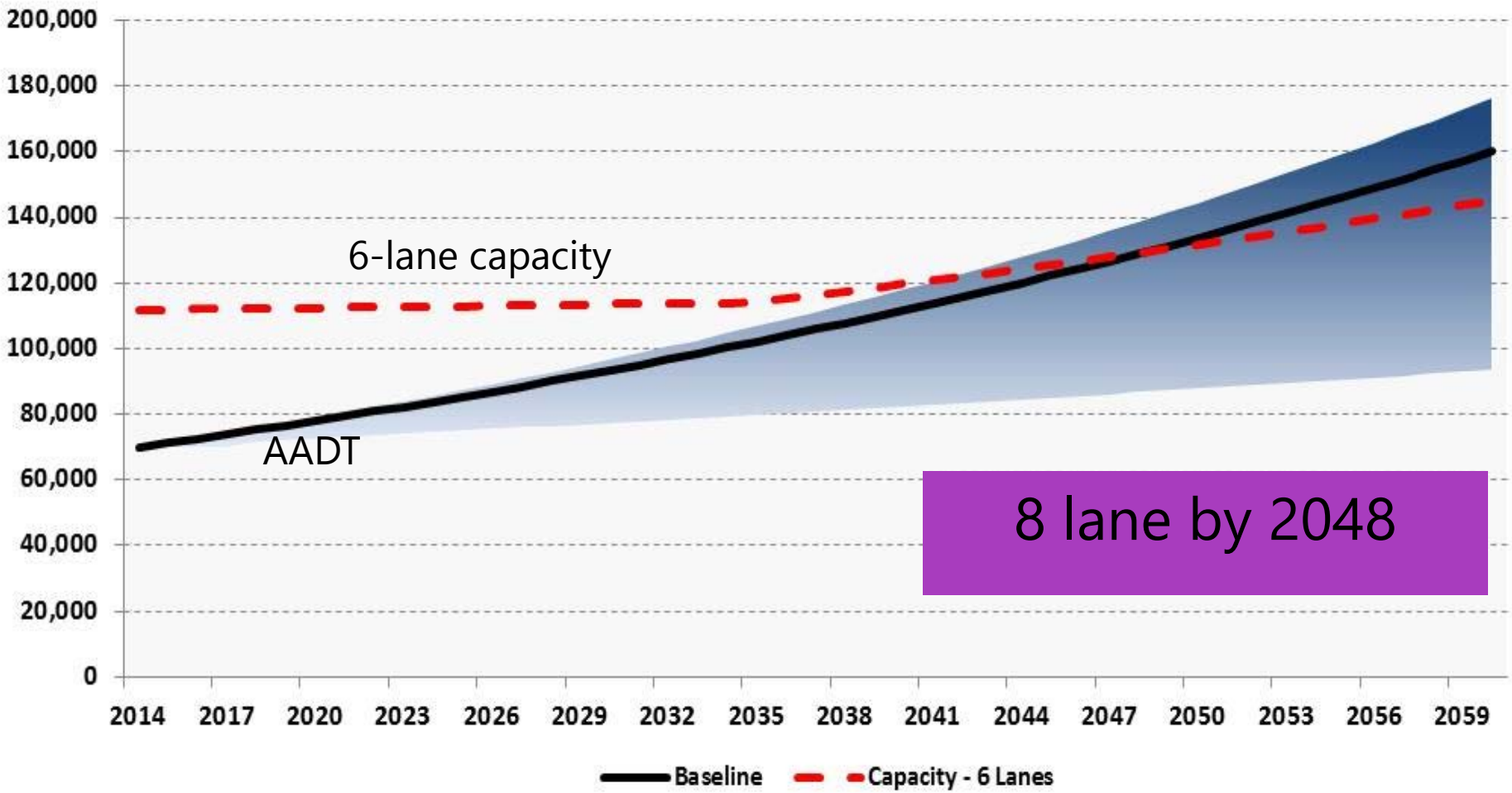
Build Scenario



New Paradigm

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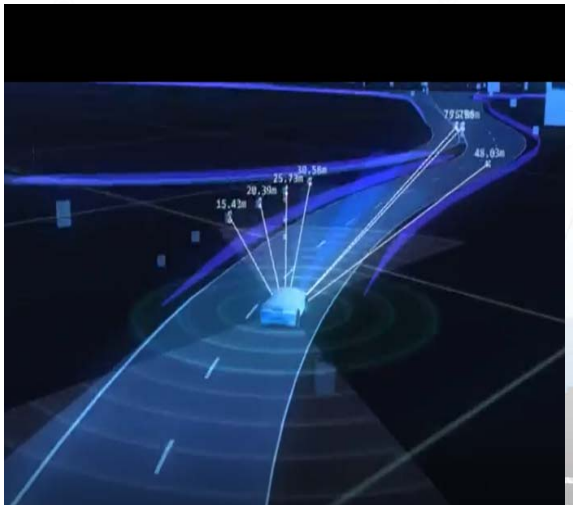
- Don't over build – cost savings
- Preserve ROW for potential future need
- Invest in technology – future proof investments
  - Cable, power, machine vision (reference markers), data management



New Paradigm

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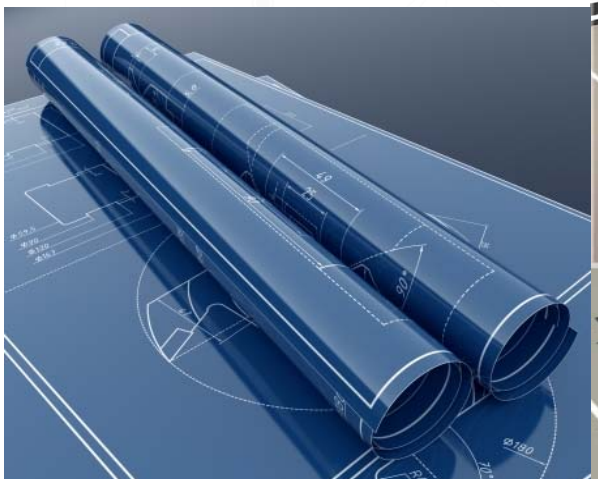
- **Design flexibly – modular lanes**
  - Dynamic lane markings
  - Right pavement design
  - Full depth shoulder
- **Technology roadmap**



Innovate the Future

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"The best way to predict the future is to invent it"

- Alan Kay, Computer Scientist

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