Meeting Summary

Project:	TransFuture
Subject:	TransFuture Sneak Preview Meeting
Meeting Date:	Monday, June 26, 2017
Location:	HDR (315 E Robinson St. Suite 400, Orlando, FL 32801) & GoToMeeting
Attendees:	John Zielinski, FDOT Santanu Roy, HDR Taylor Laurent, HDR Lori Sellers, Hanson Josiah Banet, AECOM/ FTE Steve Schnell, HDR Billy Burke, HDR Mindy Heath, AECOM/ FTE Mansoor Khuwaja, Hanson Sung-Ryong Han, BCC Engineering Bikram Wadhawan, Hanson Frank Pisani, HDR Phil Willis, HDR Mike Rose, HDR Lauren Adams, HDR Jeff Bowen, Hanson Hicham Haboussi, HDR Greg Fackler, HDR Chris Pyle, HDR Cesar Segovia, FTE Becky Bolan, FTE Henry Pinzon, FTE Jennifer Stults, FTE Rax Jung, FTE

The following is a summary of the meeting, including the key topics discussed.

I. Welcome
   a. John Zielinski opened the meeting and provided an overview of the history of the East Central Florida Corridor Evaluation Study (ECFCES), with a 50 year horizon
   b. Planning for the next 50 years requires new tools, which created the need for TransFuture.
   c. The ECFCES will be the first time the TransFuture is used for long-term planning (2040 to 2060). The tool will be used for various other studies as well. It was presented at the TRB Applications Conference and FDOT Design Conference.

II. Attendee Introductions

III. TransFuture Sneak Preview – presentation by Santanu Roy (attached)
   a. Transportation is on the verge of a paradigm shift
      i. Autonomous & Connected Vehicles Trend
         1. Roadway capacity may increase up to 5 times today's values
         2. Safety improvements – up to 90% crash reduction
         3. Livability aspects (work/life balance)
            a. Potential to live further from work and increase a commute time without impacting productivity
      ii. Shared Mobility Trend
         1. Land Use
            a. Shared parking with cars that can park themselves
            b. Houses/businesses may no longer need garages
      iii. Smart Cities Trend

        1. Trending towards increased connectivity
        2. Transportation technologies and the manner in which transportation is provided is rapidly changing:
            a. TransitX (being implemented in Chicago)
            b. Hyperloop
            c. Straddling Bus
            d. Freight Airships
            e. Drone Hubs
        3. Impacts of transportation technologies are changing
b. How to Plan for Uncertainty
    i. Identify future trends and advancements in technology
        1. Cutting edge vs. bleeding edge technologies
    ii. Strive for the optimal adoption point
c. Why now?
    i. Moore's Law – computer power doubles every two years
    ii. Market readiness is a leading factor in the speed in which technology is adopted
        1. Some degree of AV/CV is present in the market today
d. Rapidly changing environment creates a decision making challenge
    i. How do you plan for the unknown?
e. Introducing TransFuture
    i. Next generation scenario planning tool
    ii. Acknowledges uncertainty
    iii. Planning for multiple futures (scenario based)
    iv. Explicitly account for uncertainty in future projections
    v. Support a desirable future by incorporating flexibility
    vi. Add-on lens to improve decision making
        1. Post processing to standard transportation analyses
f. Planning for Multiple Futures
    i. The concept is to compare scenarios in order to identify what is plausible, possible, and probable
    ii. The results of each scenario generate a probability cone with confidence intervals for detailed review of the results
g. Development Approach
    i. Identify trends
    ii. Quantify trends
    iii. Deterministic to probabilistic
    iv. Understand uncertainties
    v. Make informed decisions
    vi. Implementation plan
h. Emerging Trends (four primary categories)
    i. Changing Demographics

        ii. Improved Technology
        iii. Shifting User Preferences
        iv. Improved Travel Options
        v. Examples
            1. Santanu provided an example of the capacity and demand increase of AV/CV in the market based on a literature review
            2. John noted that the ECFCES will use the CFX model to 2040, as they are most likely to build any new facilities to come out of the study
                a. The model is new, refined version of DW model
    i. Conceptual Framework
        i. Input regional travel demand model files and define scenarios
        ii. Processing – regression analysis, elasticity analysis, Monte Carlo Simulation
        iii. End result: probabilistic results and confidence intervals, scenario comparison, facility footprint
    j. Methodology Framework
        i. Monte Carlo Simulation accounts for uncertainty through jointly determined probabilities
        ii. N-dimensional surface to identify the optimal point of equilibrium of supply and demand
    k. Hypothetical Corridor Analysis
        i. Baseline Scenario
            1. The sample corridor would need 8 lanes in 2045 and then 10 lanes by 2056.
        ii. TransFuture Build Scenario
            1. Include potential impacts of AV/CV and aging population on the sample corridor
            2. Outputs a range of travel demand based on the analysis with confidence intervals for detailed analysis
                a. Aging population reduced demand
                b. AV/CV implementation increased capacity and increased demand
                c. Results: only 8 lanes are needed
    l. New Paradigm
        i. Cost savings by not overbuilding projects
        ii. Preserve ROW for potential future need
        iii. Invest in technology – future proof investments
            1. Fiber optic cables, power, machine vision (reference markers, data management

IV. TransFuture Demonstration – Frank Pisani provided a demo via GoToMeeting
    a. New planning tool that will extend the value of the travel demand model and assess an unpredictable future

b. Overview of tool navigation
    i. Process flowchart for tool is located on the launch page
    ii. Log-in based
    iii. Cloud-based computing
    iv. Map based interface with pre-loaded roadway segments. The user can:
        1. Search or direct-click to select roadway segments
        2. Select multiple, discrete corridor segments
        3. Modify baseline input volumes (AADT) and lane numbers in input assumptions
    v. Once the baseline inputs are in the tool, the next screen allows the user to identify the trends needed for the analysis
        1. Users can slide the dial on percentage of impact of the preloaded trends for multiple years between now and 2060
            a. Preloaded trends include: aging population, workforce automation, urban living, online shopping, etc.
        2. Sources for the background for each trend are made available in the tool as well, by selecting "View Source"
    vi. Results
        1. Series of graphs to provide analysis on how results are impacted by the trends over time
    vii. User can run and save multiple scenarios within the tool and compare them

V. TransFuture Demonstration Discussion
a. Discussion was held about the mix of traffic, such as truck percentage, as an input
    i. This does not impact the analysis. TransFuture accounts for volume, not volume type at this point
b. Josiah noted that anything included in the Turnpike model is cost feasible (did not include any items that were not considered cost feasible)
    i. Turnpike model doesn't include the new corridors because they have not yet been shown to be cost feasible
    ii. Land Use (2040 LRTP) and development trends are included in the model
c. It was requested that TransFuture report the length of the roadway segments selected for analysis
d. The user can view the source of the default variables for the trend analysis by selecting the "View Source" button
    i. Links are provided to directly connect to the original source documents.

VI. Open Discussion
a. The individual scenario baseline is the original model file input into TransFuture
    i. The TransFuture analysis is a post-process to the model files, and is based on the original model file for the specific project
b. Trip generation and capacity are the two major components for future roadway demand analysis, typically to 2040, and long term 2060

        i. The trends identified in TransFuture are not directly addressed in current traffic models

    c. Does the analysis reflect whether the roadway segments are urban/rural or land use? Are the results shown in a composite for all segments selected?
        i. Yes, urban/rural and land use are included in the analysis. No, TransFuture does not create a composite result for all segments in the analysis (not of much value). Results are reported by roadway segment.

    d. Check that capacities on two sequential roadway segments are consistent along the entire roadway.
        i. That check was included in the QC process for the development of TransFuture.

    e. When will the tool be released for use?
        i. TransFuture is ready to launch. John will send an announcement soon.

    f. Confidence intervals allow for a discussion of risk during long term planning and decision making.

    g. What computer system is running the model to generate results so quickly?
        i. In a demand model, the model goes through every step in order to determine the equilibrium. TransFuture uses cloud based computing for faster results.
        ii. TransFuture is also faster due to having “seed runs” loaded into the tool, which serve as reference points in order to reach the user-defined scenario’s equilibrium point.

VII. Closing

    a. Meeting notes will be distributed along with a copy of the presentation and the VPTI report (AV/CV report that was discussed in detail by the group)

    b. John noted that the next iteration of the tool will also include a cost savings calculator

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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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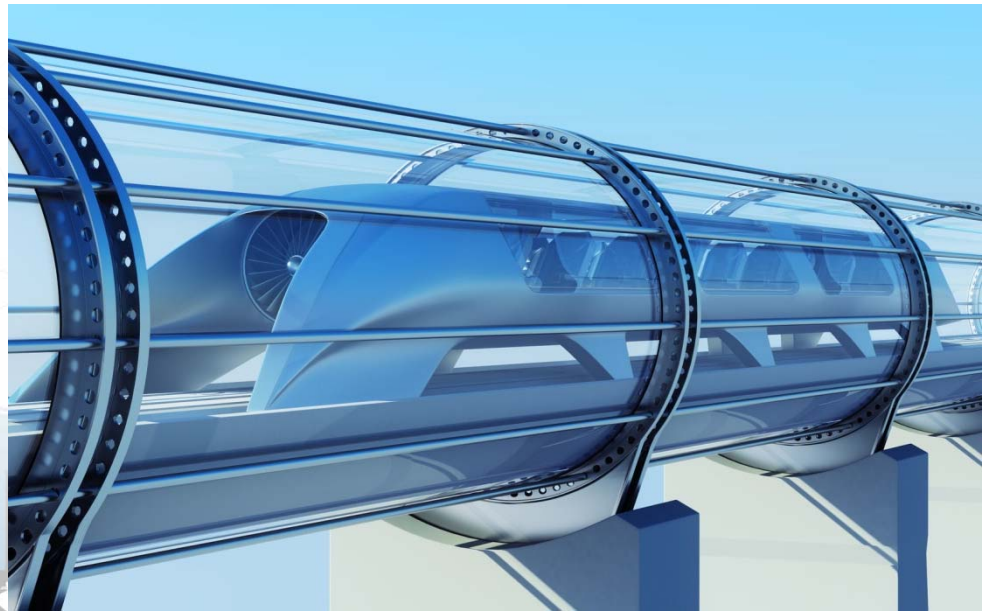
Straddling Bus ▲ ▼ Transit X

Helium Airships ▲ ▼ Hyperloop



Science or Fiction?

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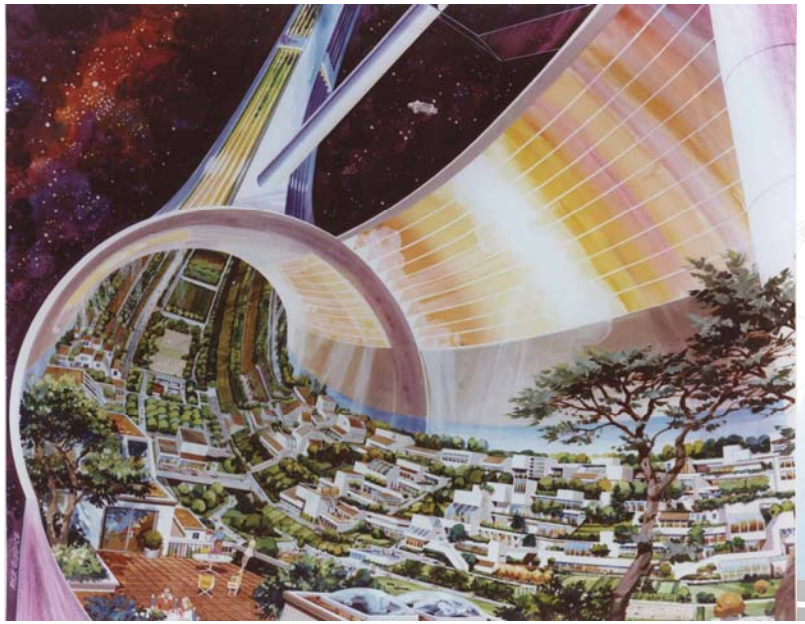
Drone Hub ▲ ▼ Space Colony



Space Tourism – Vacation of the Future ▼

Transformation is Real

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Sorting Facts from Fiction

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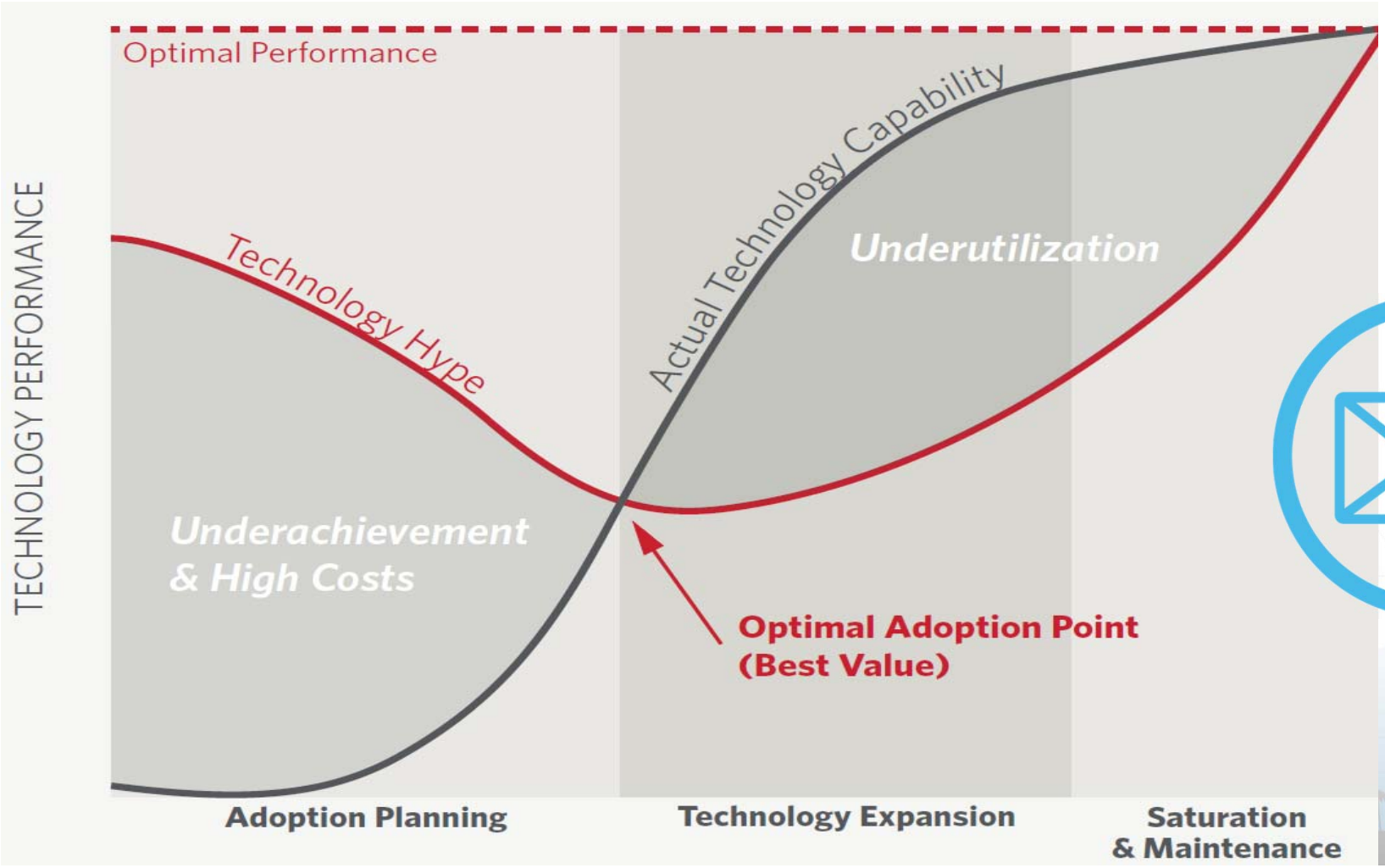
- Optimal adoption point for best value
- Cutting edge vs. bleeding edge



Why Now?

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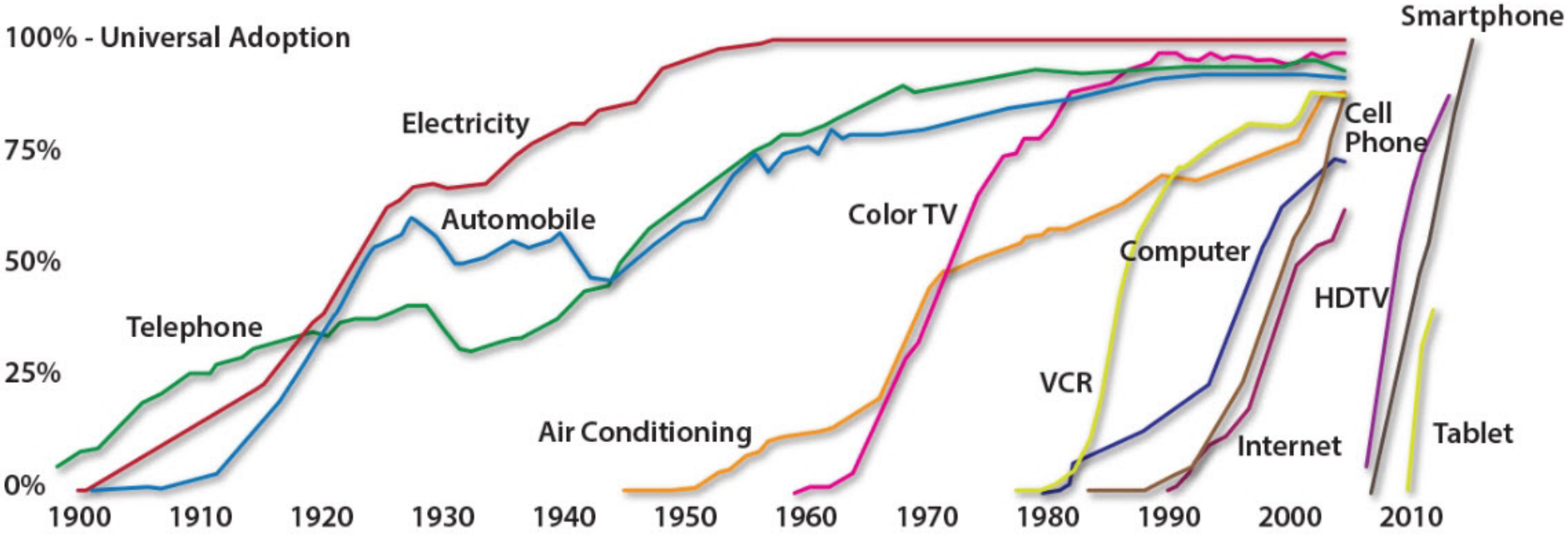
- Moore's law – computing power doubles every 2 years



Market Readiness

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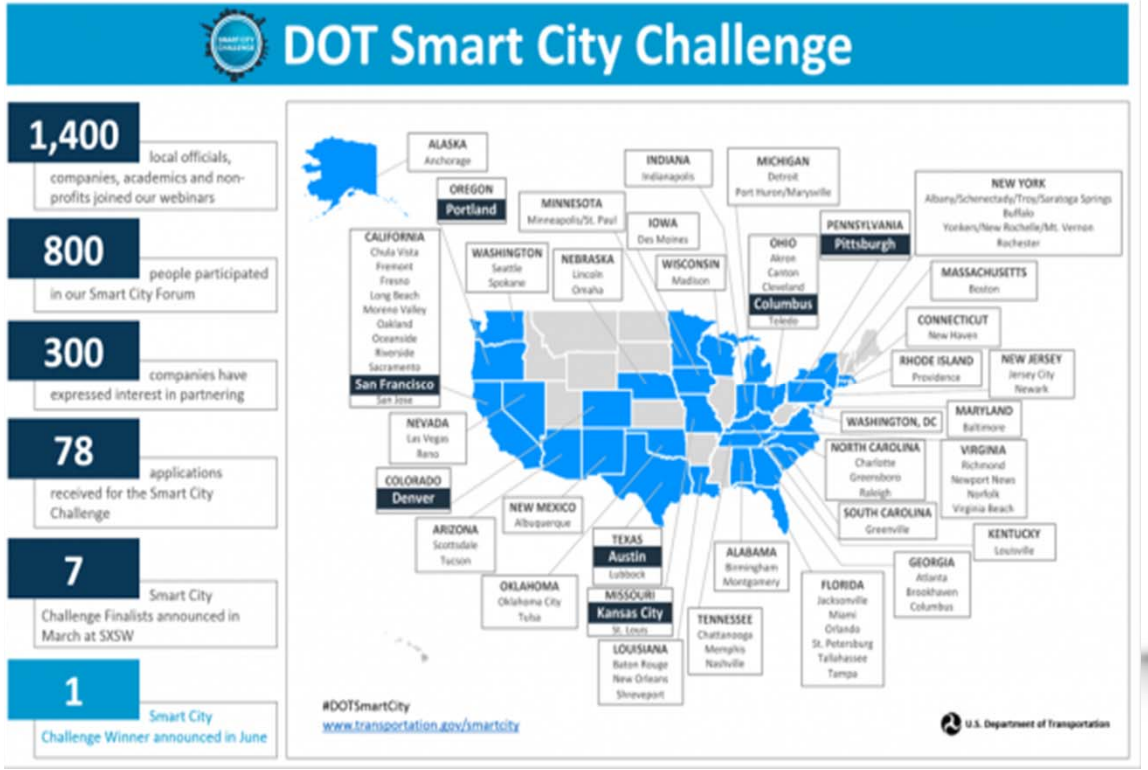
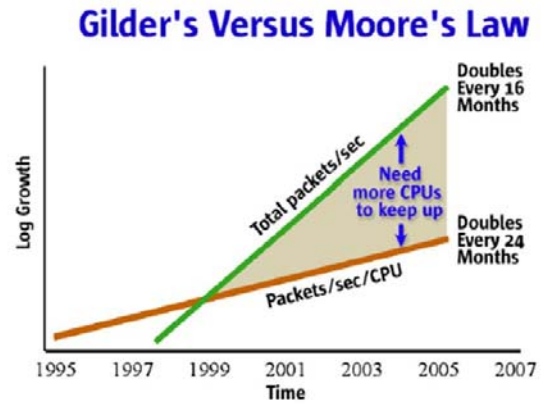
- 78 cities participated in Smart Cities challenge
- 34 States enacted autonomous vehicle legislation since 2012
- Most new vehicles sold today have advanced features





Source: The Net Effect

Market Readiness

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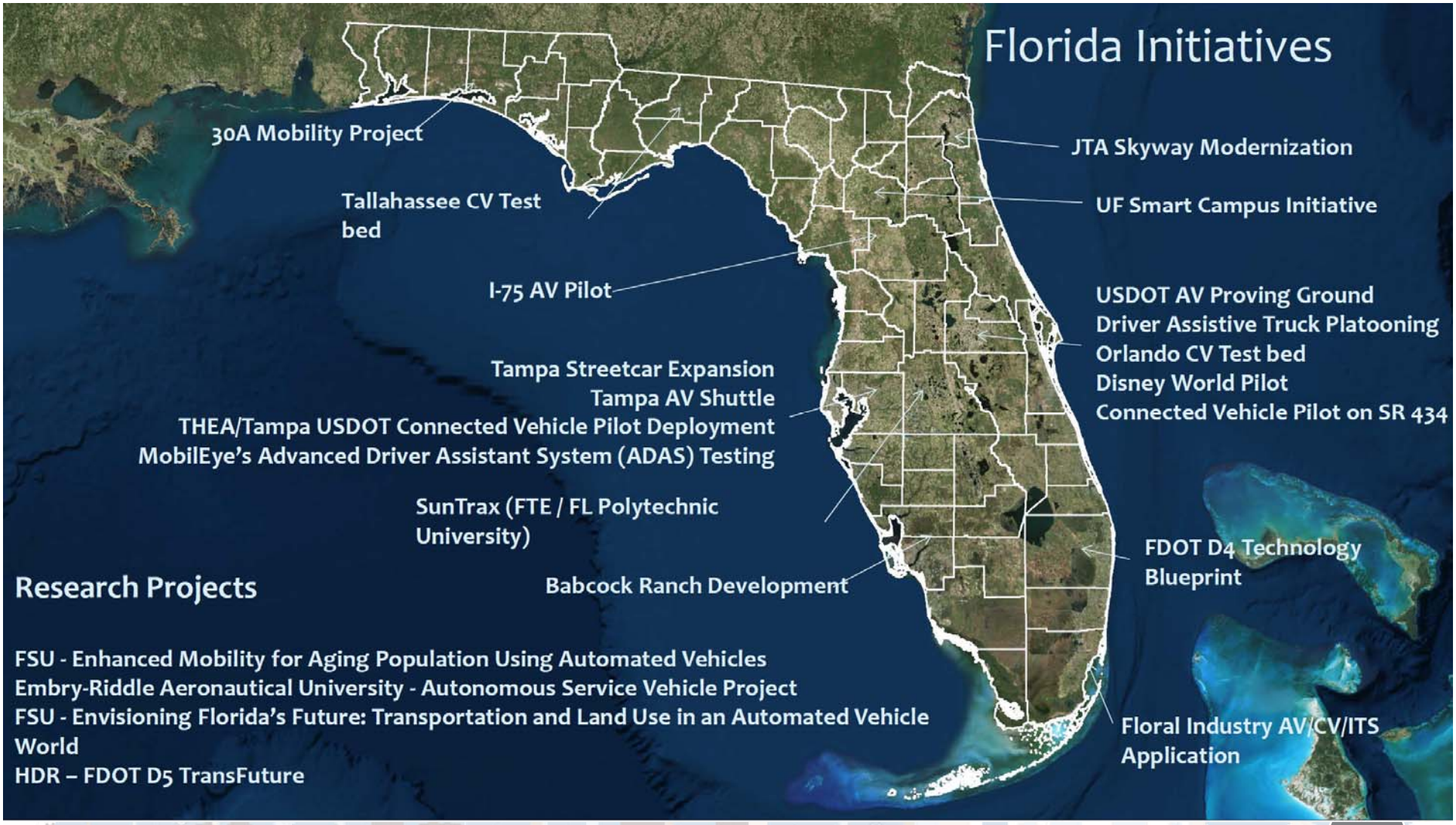

Research Projects

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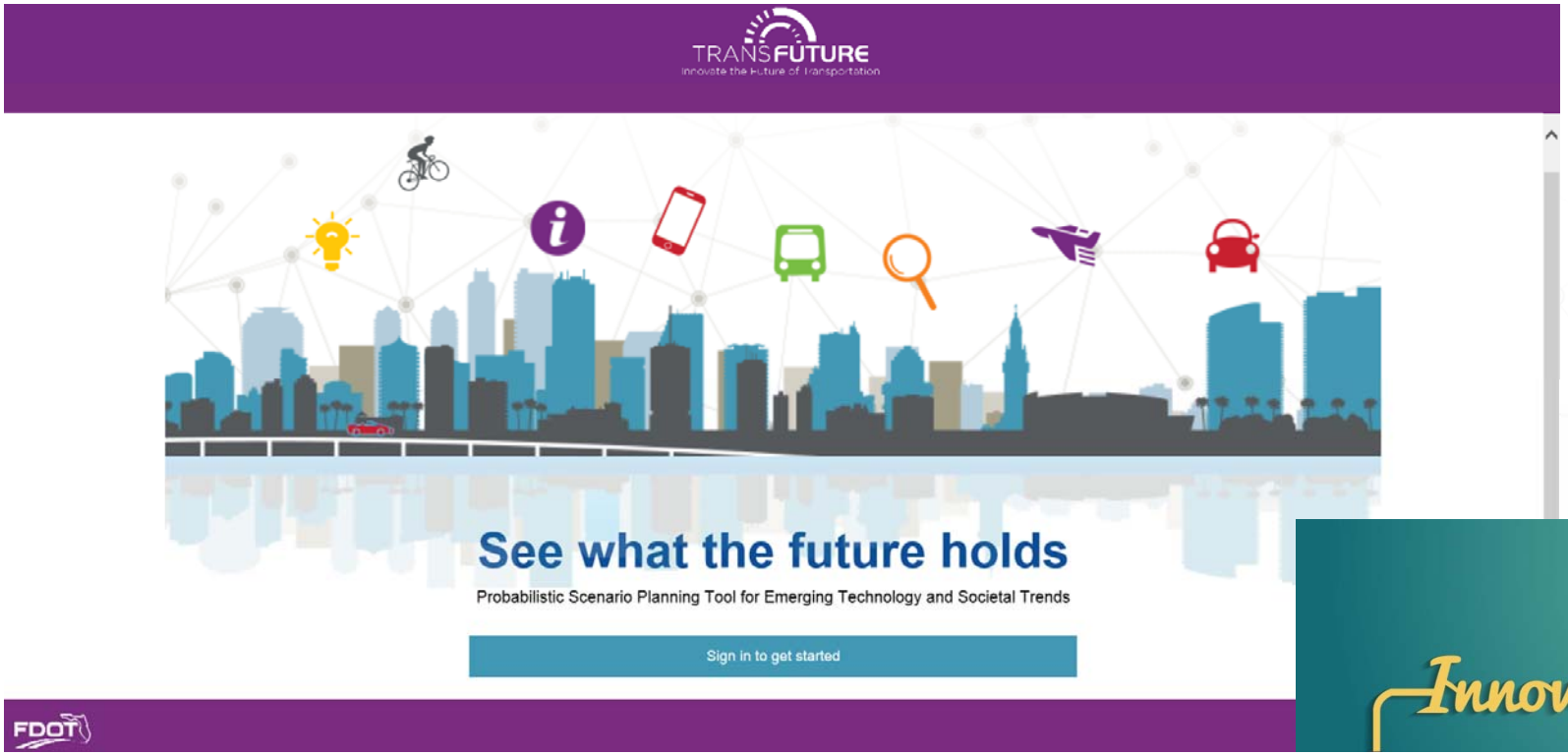
- Next-gen scenario planning tool
- Prepare for multiple futures
- Explicitly account for uncertainty
- Support a desirable future by incorporating flexibility
- Add-on lens to improve decision-making



Planning for Multiple Futures

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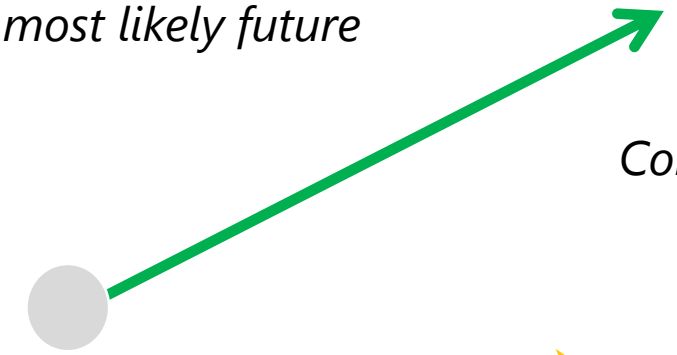
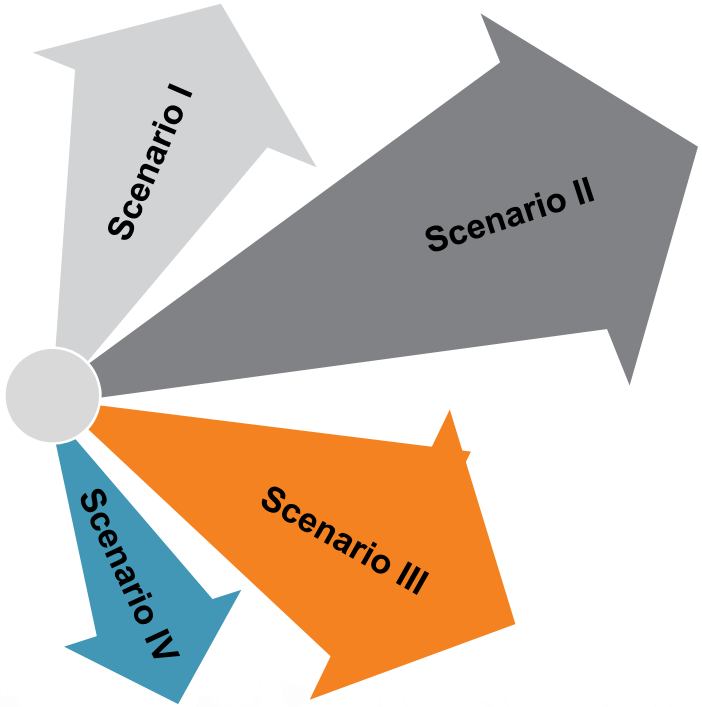
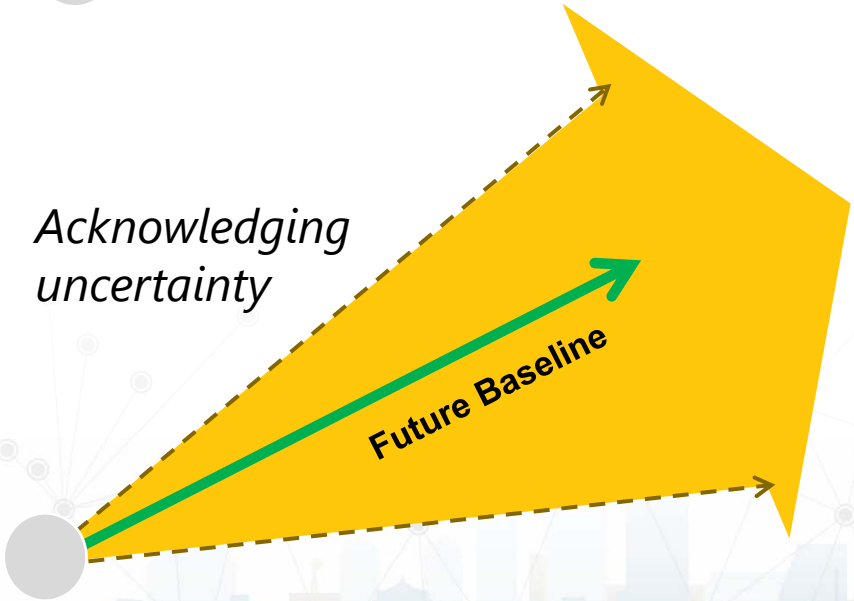
Traditional planning for most likely future



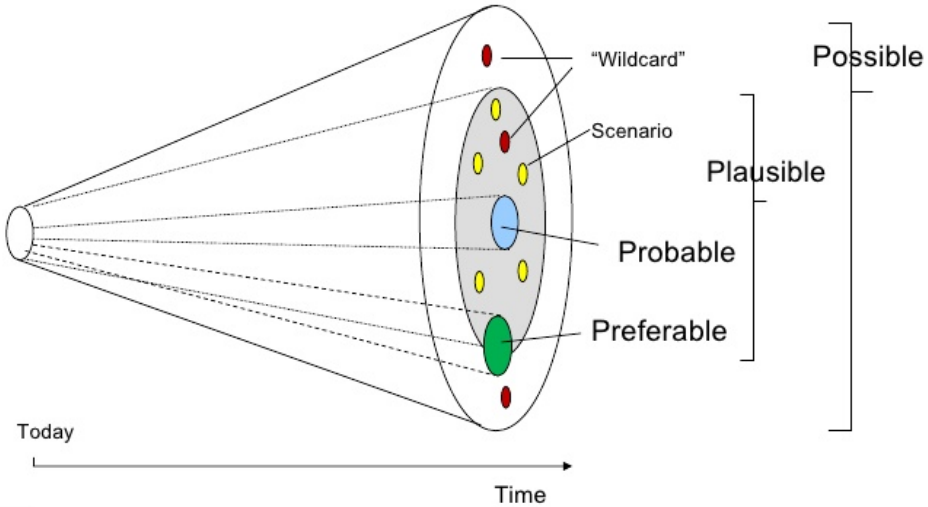
Considering multiple futures and uncertainties



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 • Rise of robots • 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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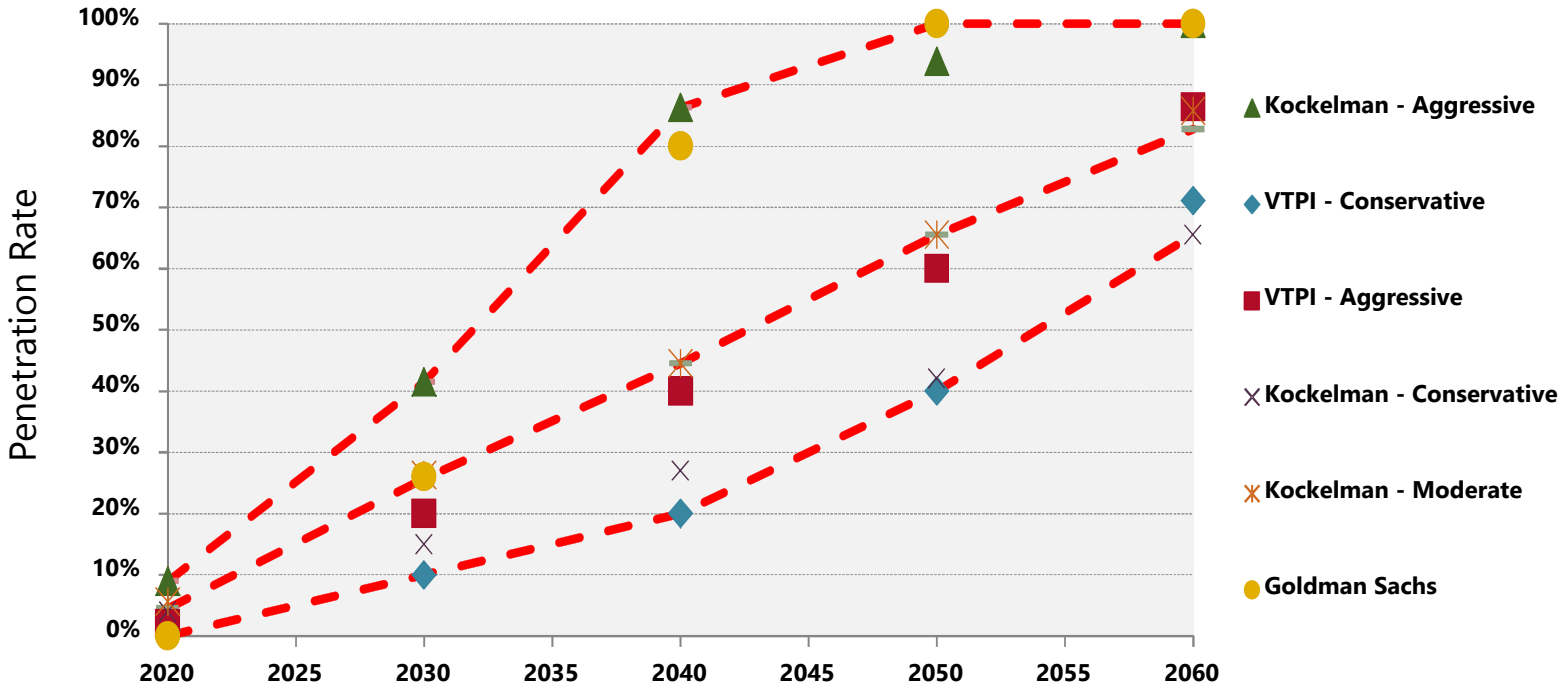
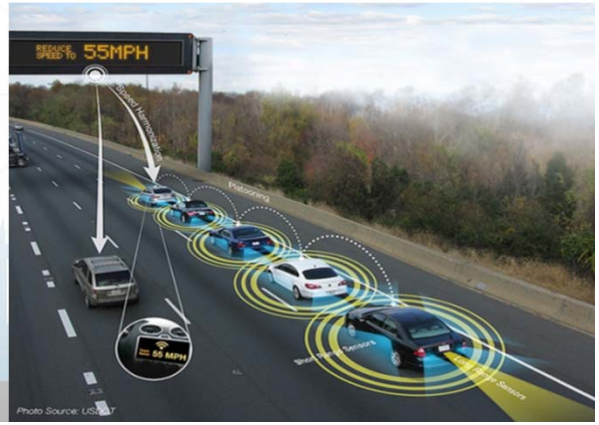
- Capacity and demand increase



Market penetration

Early adoption - trucks?

Connected features in cars



Shared Mobility

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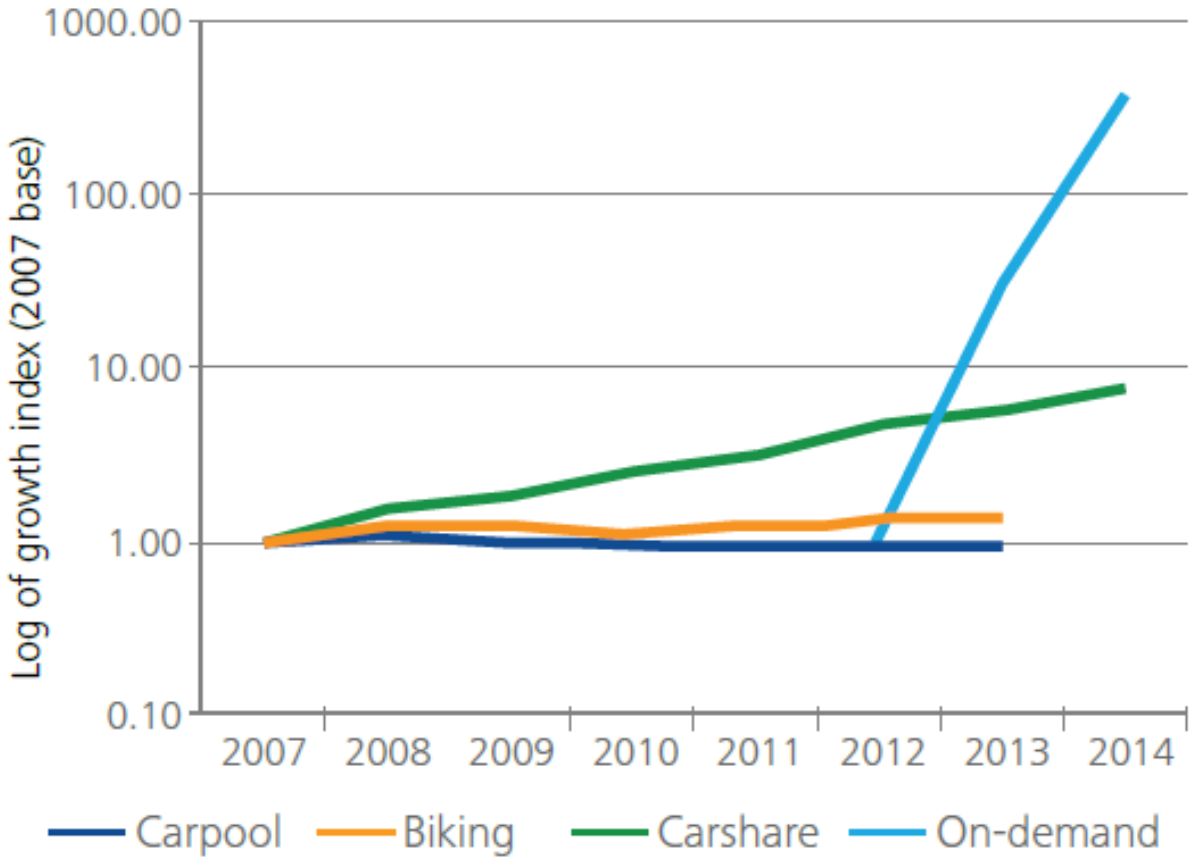
- Reduction in auto ownership
- Potential increase in trips
- Fleet size reduction



Workplace Automation

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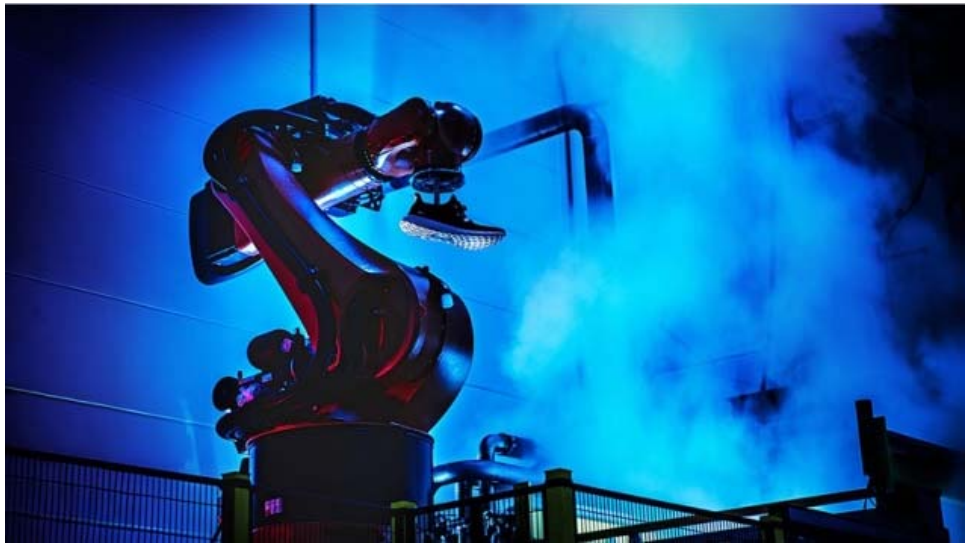
- Jobs at risk for automation
- Transformation of the labor force
- Jobs of Generation Z (1995-today)



Conceptual Framework

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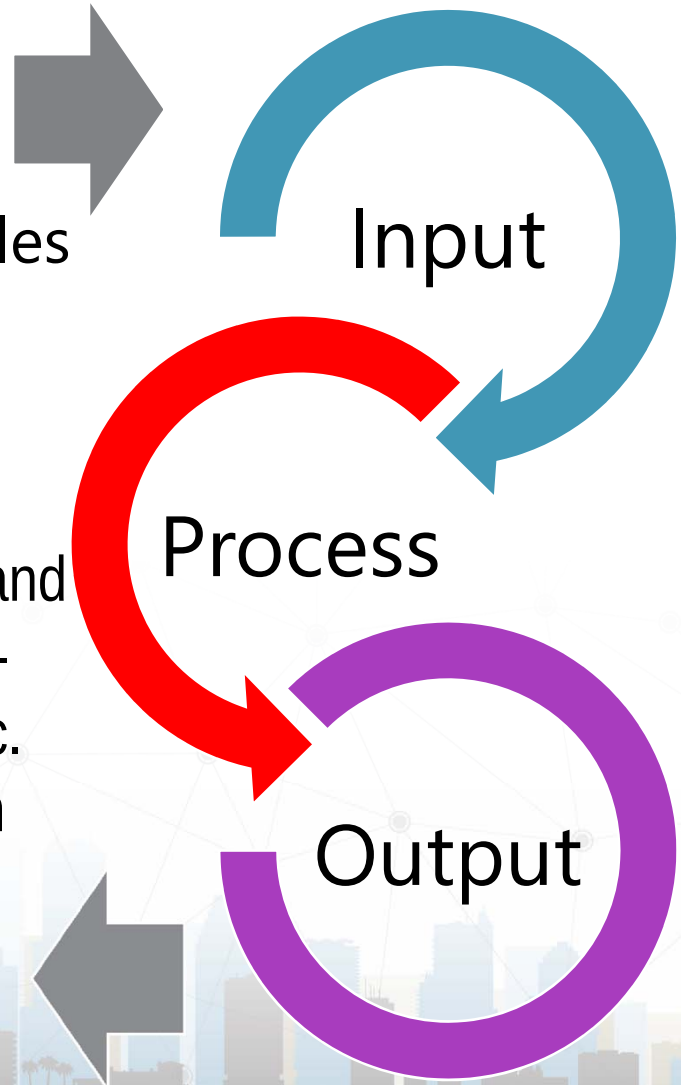
Frontend

- 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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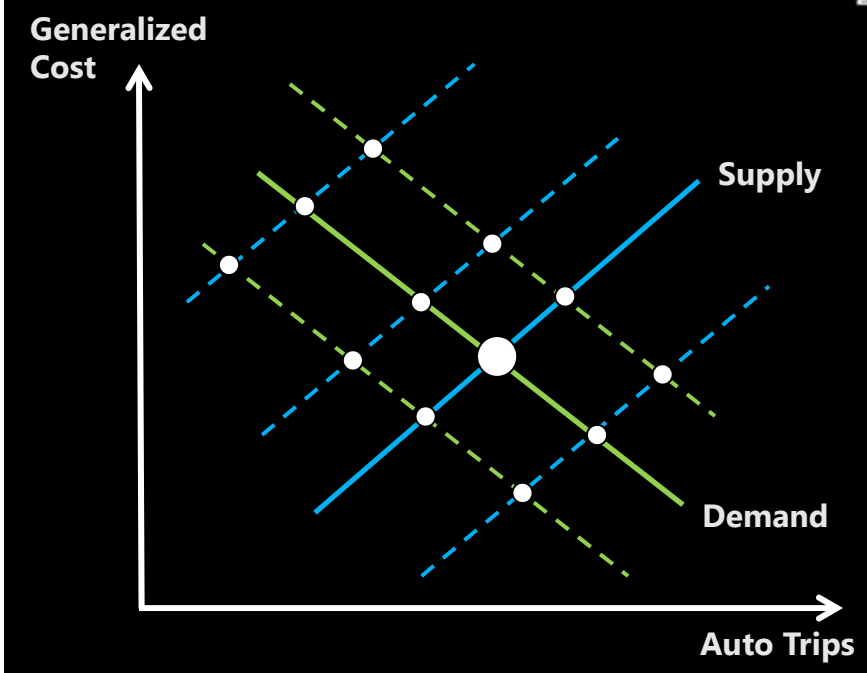

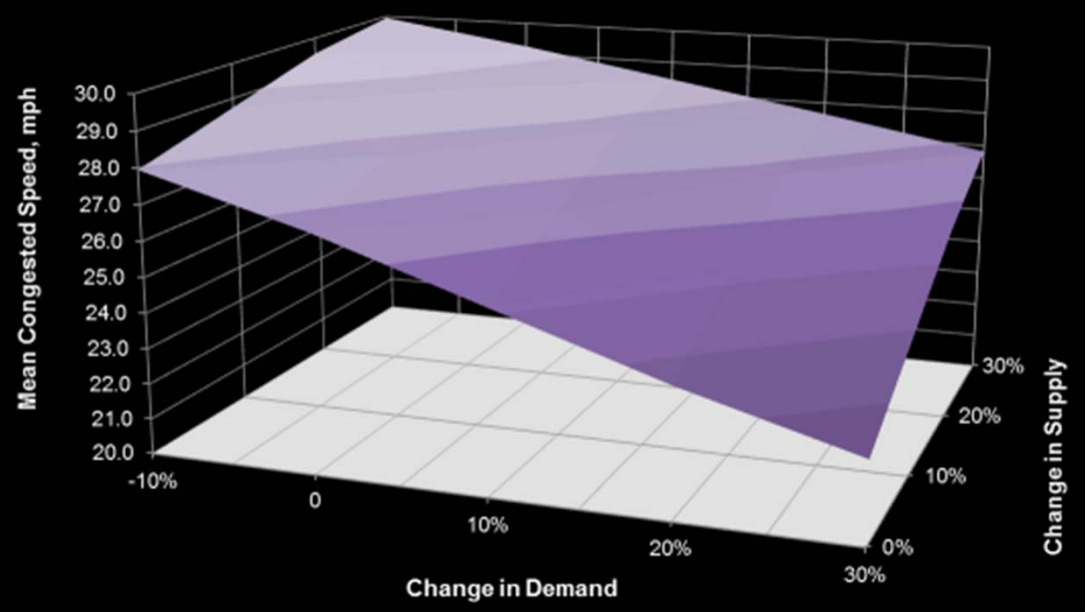

- N-dimensional supply-demand surface
- Quantifying impacts of emerging trends

Accounting for Uncertainty

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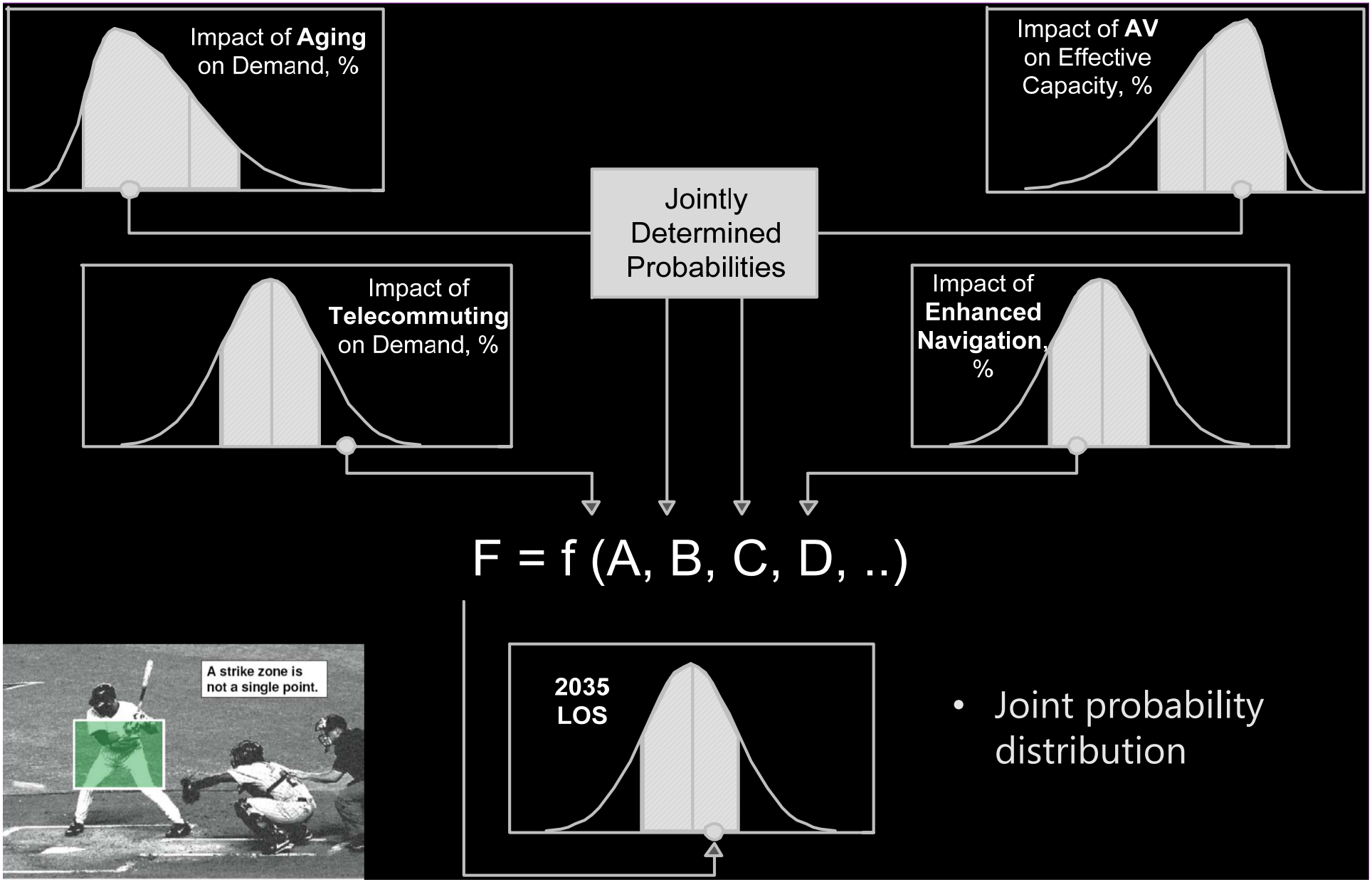

- Joint probability distribution

Hypothetical Corridor Analysis

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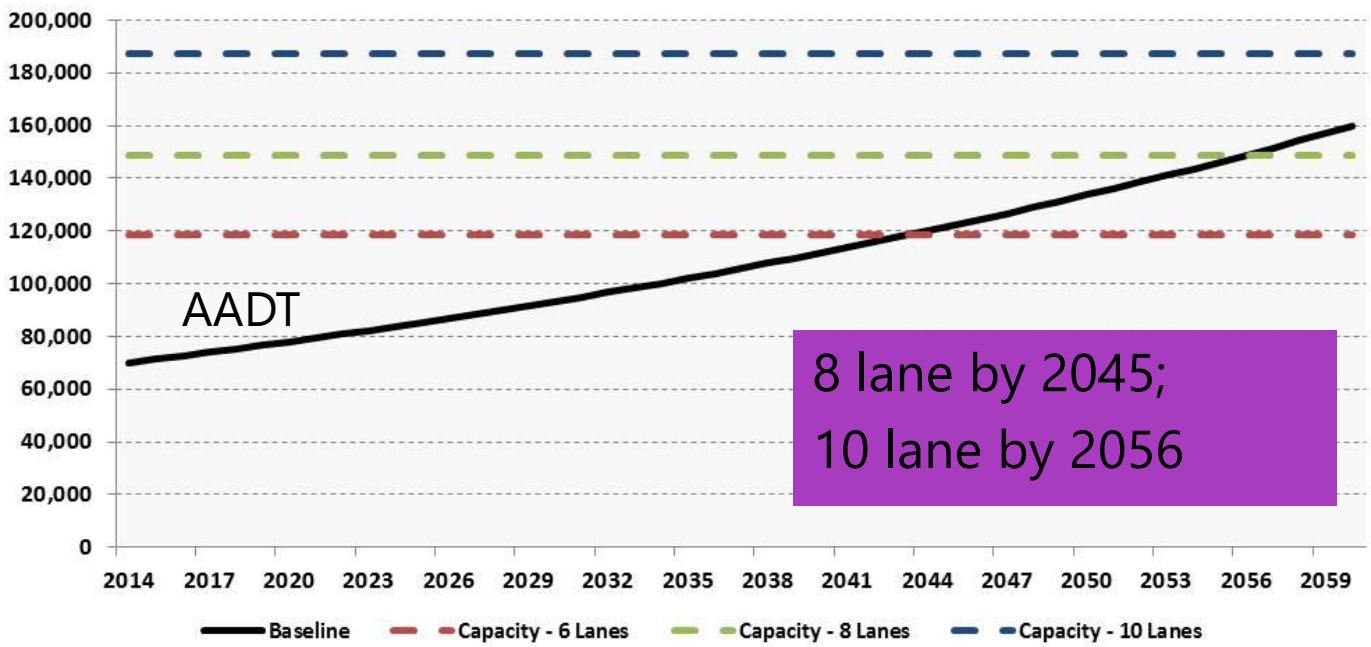
Baseline Scenario



10-lane capacity

8-lane capacity

6-lane capacity

Hypothetical Corridor Analysis

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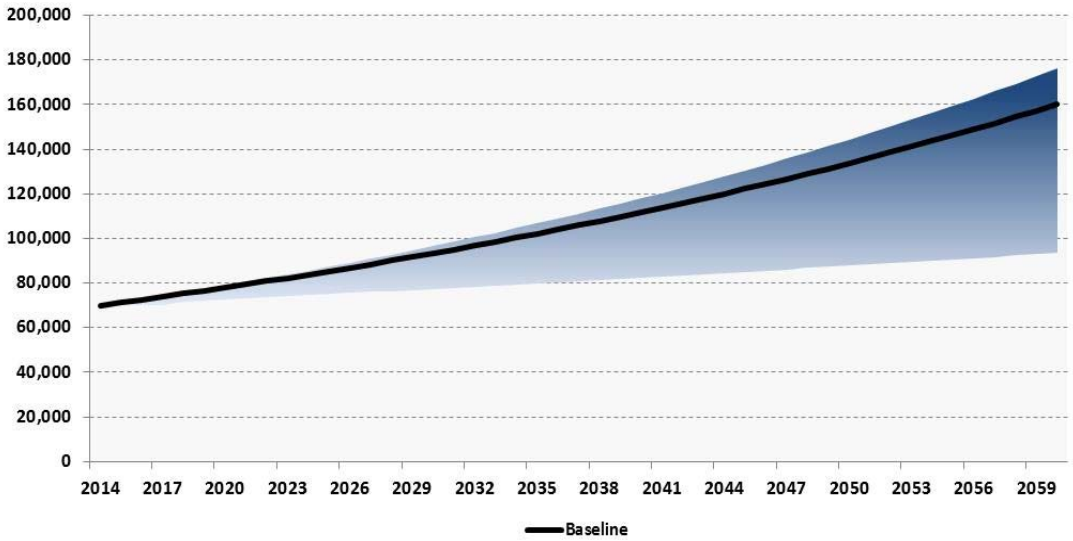
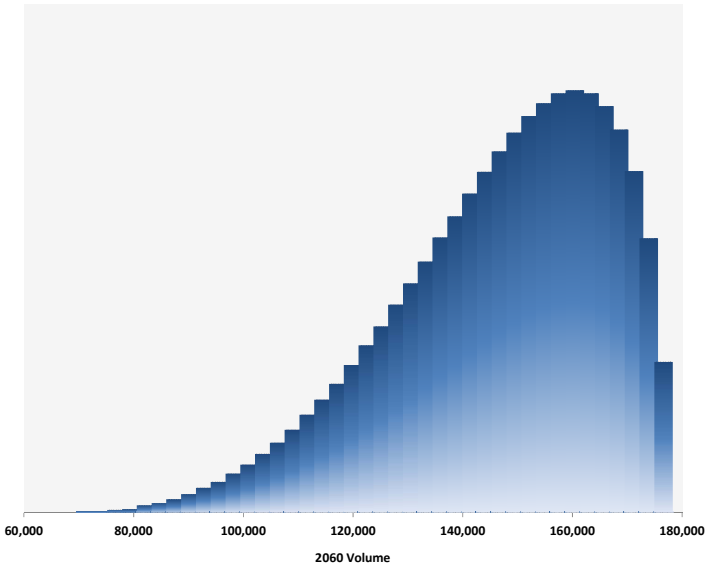
Build Scenario



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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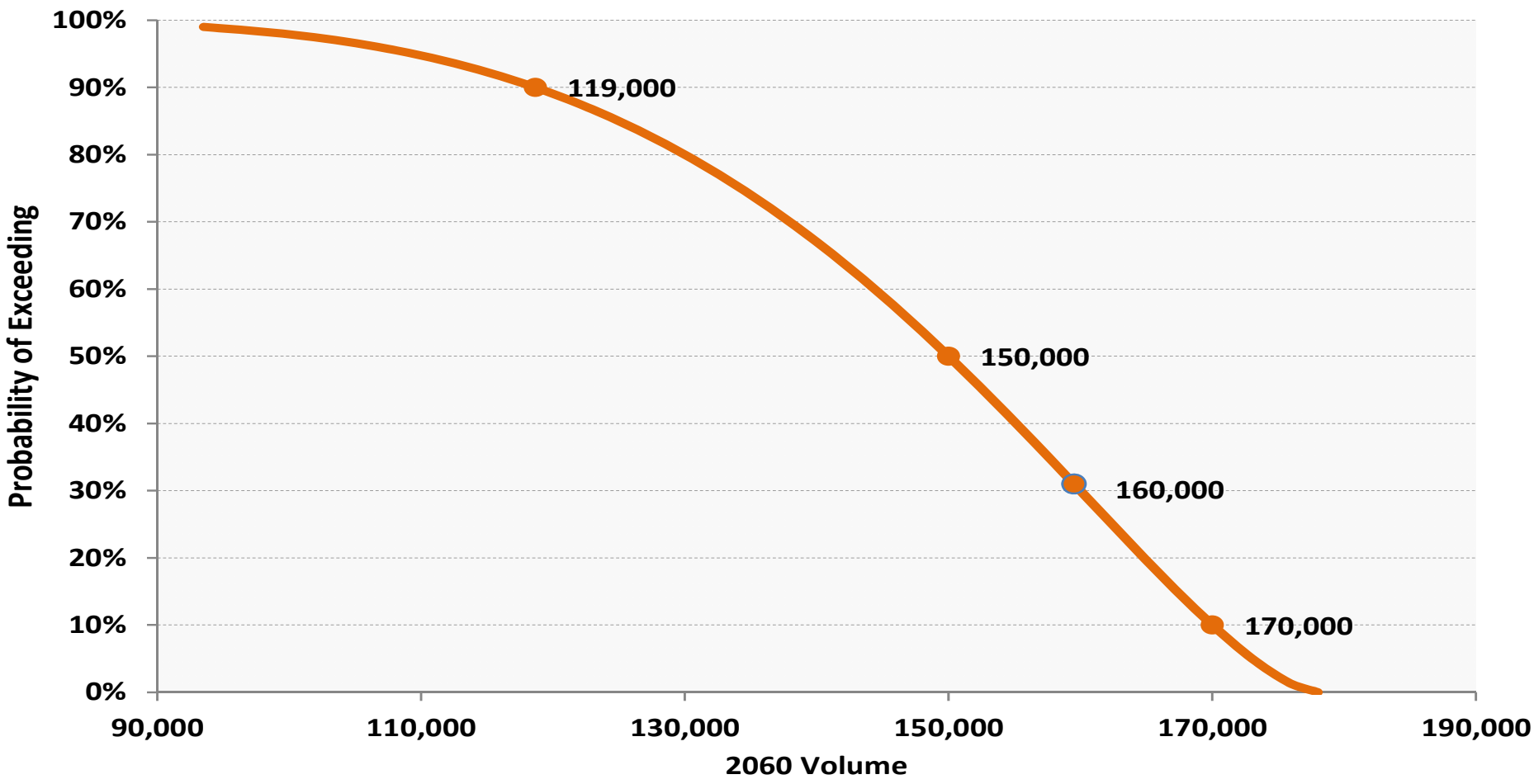
Build Scenario

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



Hypothetical Corridor Analysis

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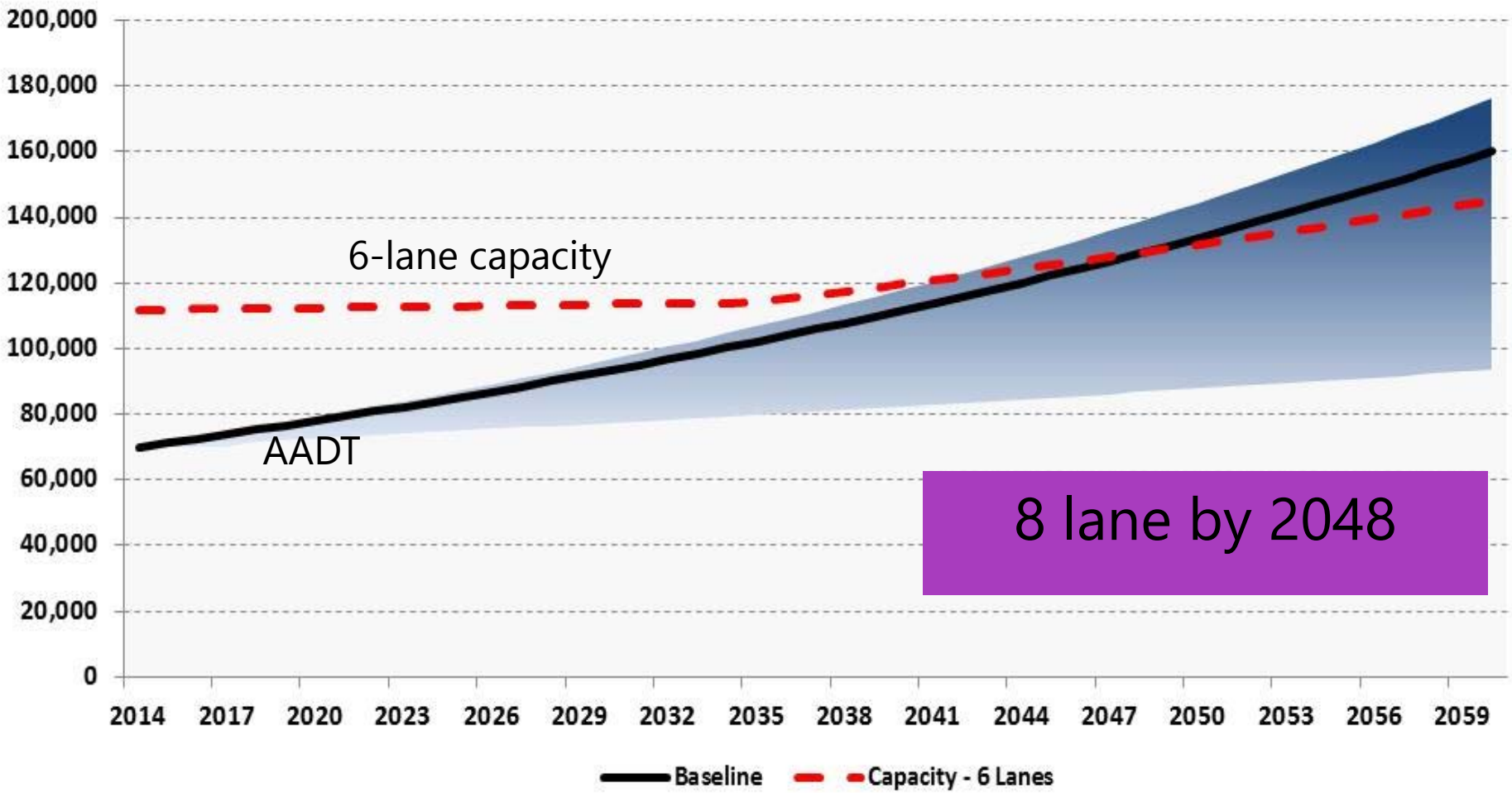
Build Scenario



New Paradigm

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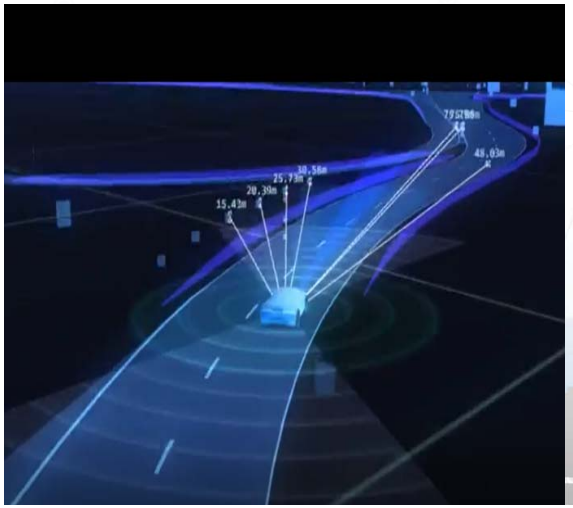
- Don't over build – cost savings
- Preserve ROW for potential future need
- Invest in technology – future proof investments
  - Cable, power, machine vision (reference markers), data management



New Paradigm

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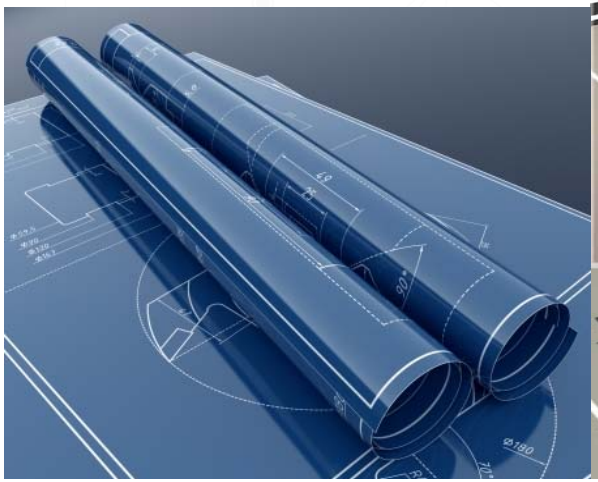
- **Design flexibly – modular lanes**
  - Dynamic lane markings
  - Right pavement design
  - Full depth shoulder
- **Technology roadmap**



Innovate the Future

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

- Alan Kay, Computer Scientist

CONTACTS

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