

Lessons Learned in Transportation Scenario Planning

**Wednesday, September 11, 2019
2:00-3:30 PM ET**

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REGISTERED CONTINUING EDUCATION PROGRAM



Purpose

Provide an overview of the [Massachusetts' Commission on the Future of Transportation Commonwealth](#) findings and what these insights mean for other states and cities and what they plan around future forces in transportation

Learning Objectives

At the end of this webinar, you will be able to:

- Describe the Commission on the Future of Transportation in the Commonwealth
- Apply scenario principles
- Describe lessons learned and commissioners' perspectives



Presentation on the Report of the Commission on the Future of Transportation in the Commonwealth

September 11, 2019

Choices for
Stewardship:
Recommendations to
Meet the
Transportation Future

VOLUME I

Submitted Pursuant to
Executive Orders 579 and 580

COMMISSION ON THE FUTURE OF TRANSPORTATION IN
THE COMMONWEALTH



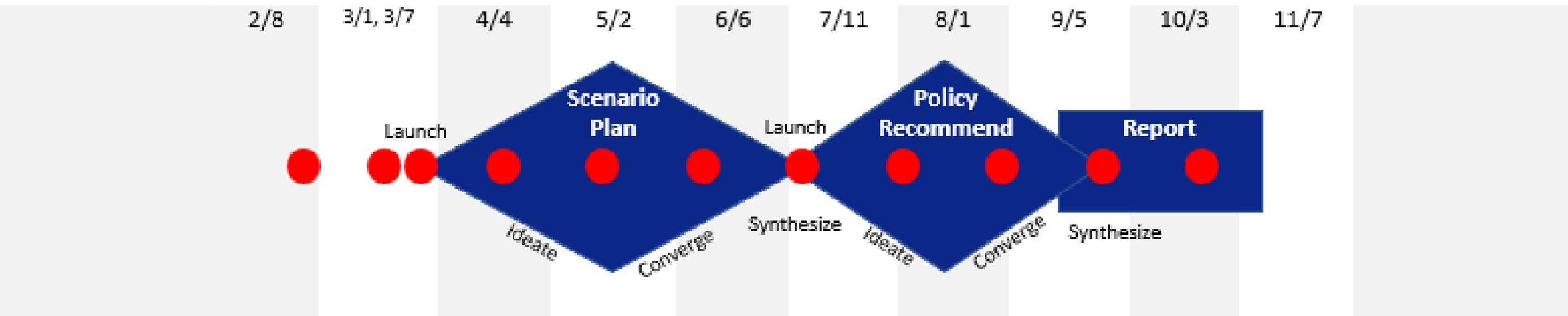
I. Establishment of the Commission

Working on a Tight Schedule

Phase 1: Facts and Trends

Phase 2: Scenario Planning

Phase 3: Recommendations



II. Impetus of the Commission: Disruptive Forces Facing MassDOT

Disruptive Forces: Facts, Trends & Issues

Demographics and Land Use

- The Massachusetts population is expected to grow by 600,000 residents between now and 2040. Population growth is concentrated in the eastern part of the state.
- The state workforce has already grown by over 350,000 jobs since 2010, and job growth is expected to continue.
- The state's population is, on average, older than that of many other US states, and projections indicate that those over 65 are poised to be an even bigger share of the state population.

Transit, Active Transportation, and Mobility Services

- As is true nationally, ridership on the Massachusetts Bay Transportation Authority (MBTA) and on most of the state's Regional Transit Authorities (RTAs) has been declining for the past several years. However, this trend is not uniform: MBTA Blue Line and Commuter Rail ridership has increased since 2015, as has ridership for MetroWest Regional Transit Authority.
- Though they represent a small percentage of total trips in the Commonwealth, use of transportation network companies (TNCs) has exploded over the past several years, primarily within Greater Boston and among those under 40 years old.
- Bicycling and walking as forms of transportation have increased since 2017, particularly in communities close to Boston.

Autonomous and Connected Vehicles

- Projections vary as to the extent and pace of connected and autonomous vehicle (C/AV) adoption, and suggest that anywhere from 19 to 75 percent of all vehicles on the road in 2040 could feature Level 4 automation which would not require human drivers. C/AVs have the potential to radically change transportation and mobility, and have a myriad of both positive and negative possible implications for society.
- At least 42 states have enacted legislation and/or signed executive orders that address testing of C/AVs, including Massachusetts.

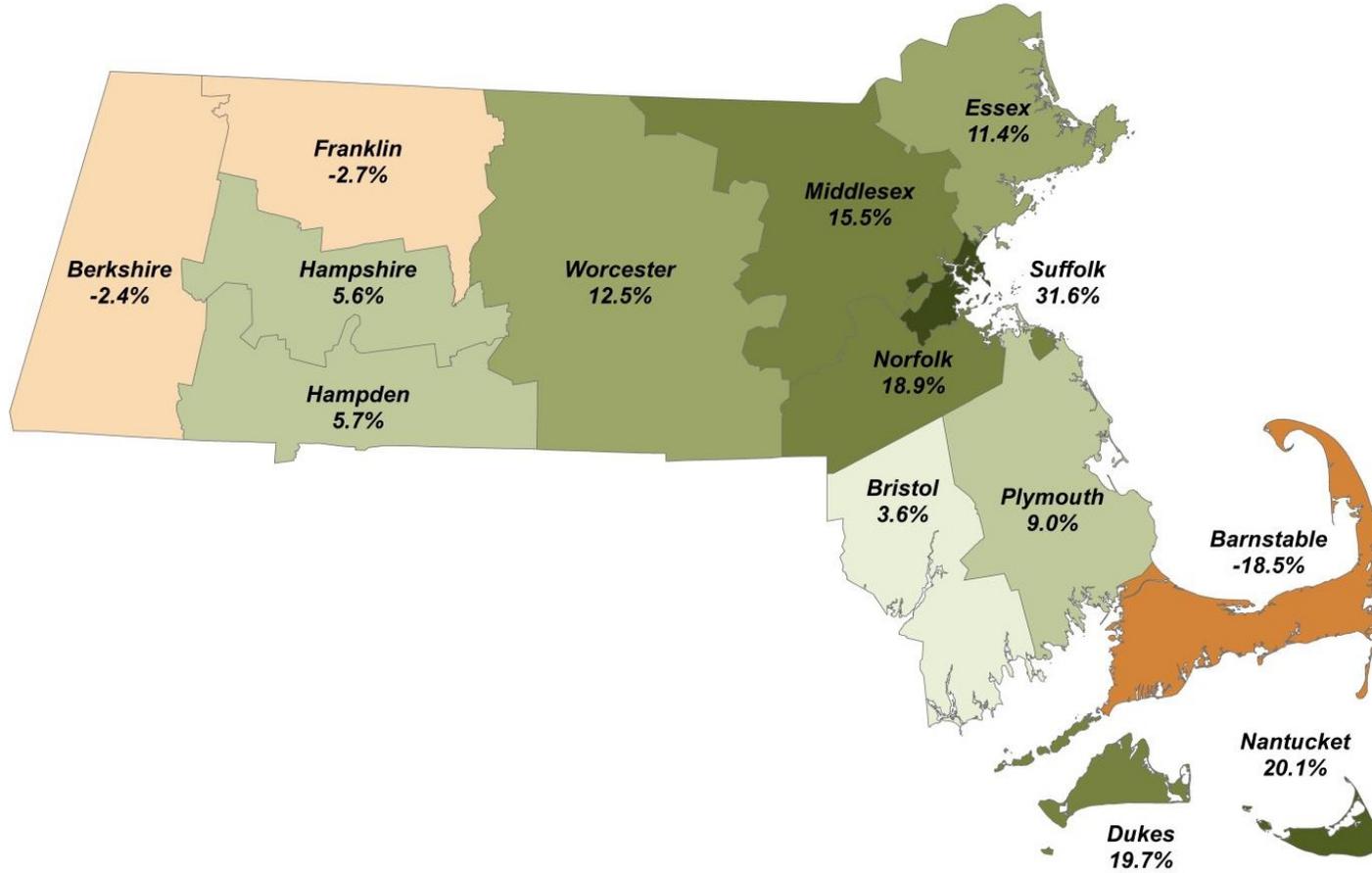
Climate Change and Resilience

- A recent report of the United Nations' Intergovernmental Panel on Climate Change (IPCC), a leading authority on climate science, warned that the impacts of climate change are happening both sooner and more intensely than originally thought with significant implications by 2040 without strong actions now. The US Fourth National Climate Assessment report released in November 2018 also projects significant climate change and that, by 2035, the Northeast will see the largest temperature increases in the contiguous United States, among other changes.
- Transportation infrastructure is affected by climate change. People travel differently in extreme weather, and weather not only wears on infrastructure, but infrastructure has physical reactions to extreme weather conditions, including damaged or obstructed roads and sidewalks or warped rail lines. As Massachusetts experienced in 2015, extended cold periods also affect the ability to clear snow and ice from roadways and other infrastructure.
- Transportation also exacerbates climate change, both nationally and locally. In Massachusetts, almost 40 percent of all GHG emissions in 2015 came from transportation infrastructure and vehicles, with nearly half of the contributions coming from passenger vehicles alone. Without further action, transportation sector GHG emissions are projected to increase.

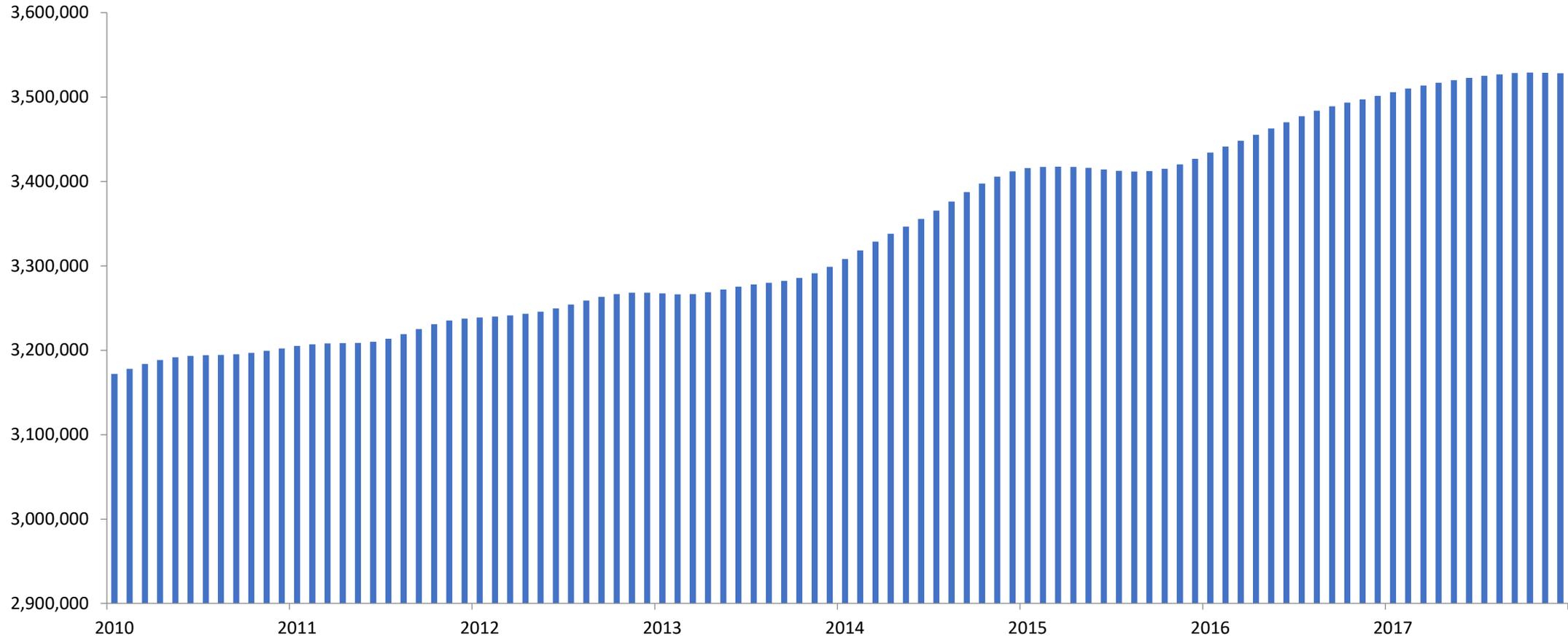
Transportation Electrification

- Electric vehicles (EVs) are often identified as a key part of the solution to transportation-related emissions, but adoption remains stubbornly slow. In 2017, just over one percent of all vehicles sold in the United States were electric.
- In 2017, 1.4 percent of all light-duty vehicles sold in the Commonwealth were electric, and 12,000 EVs were on the roads here. However, some recent projections have shown a significant increase in the number of EV sales happening soon. Projections are frequently revised to reflect greater optimism about their adoption.
- A future of electrified transportation will require a regional electricity grid able to consistently supply sufficient power, as well as a comprehensive network of charging facilities.

Population growth in state: ~600,000

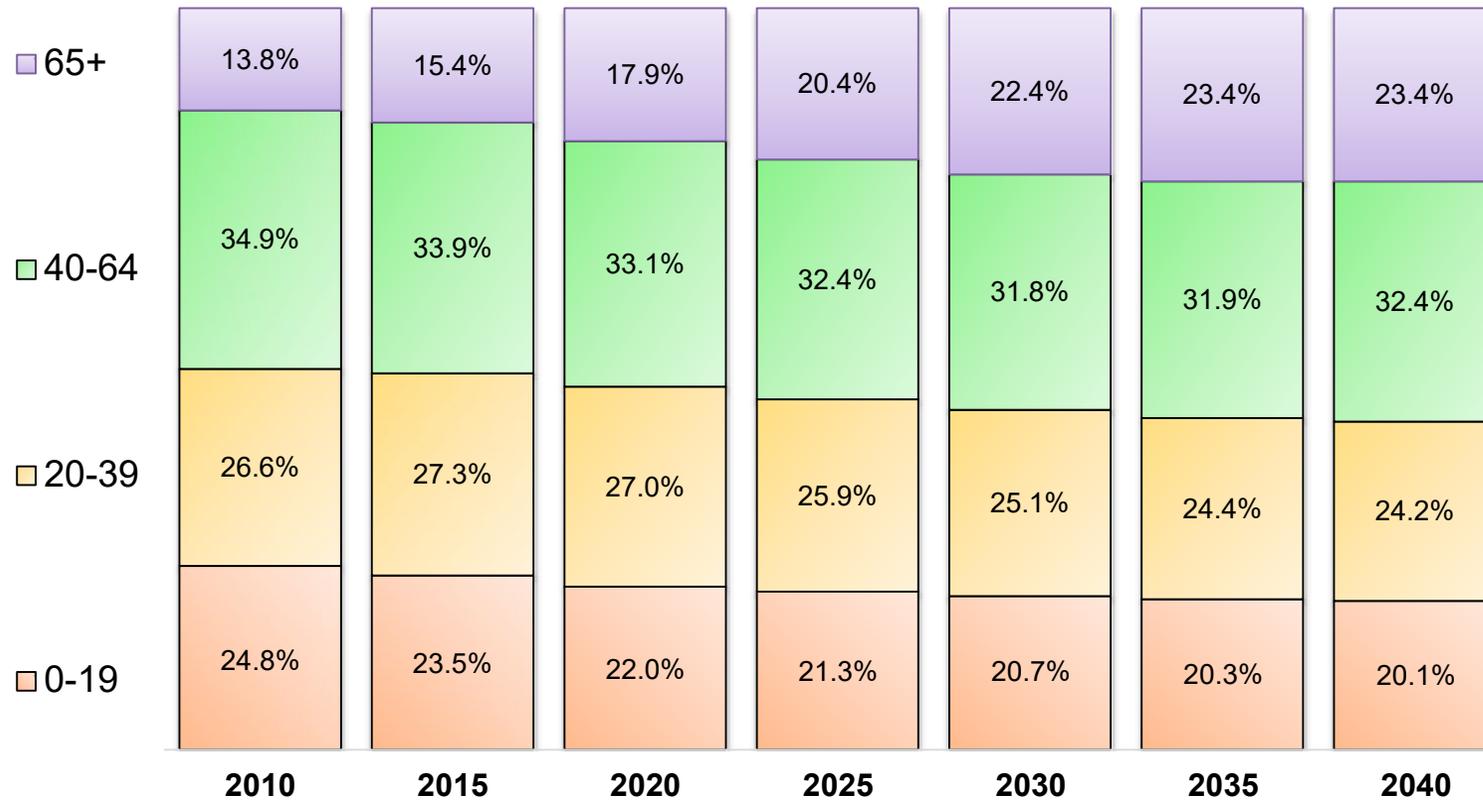


Over 356,000 newly employed (2010-2017)



65+ nearly doubles as share of population

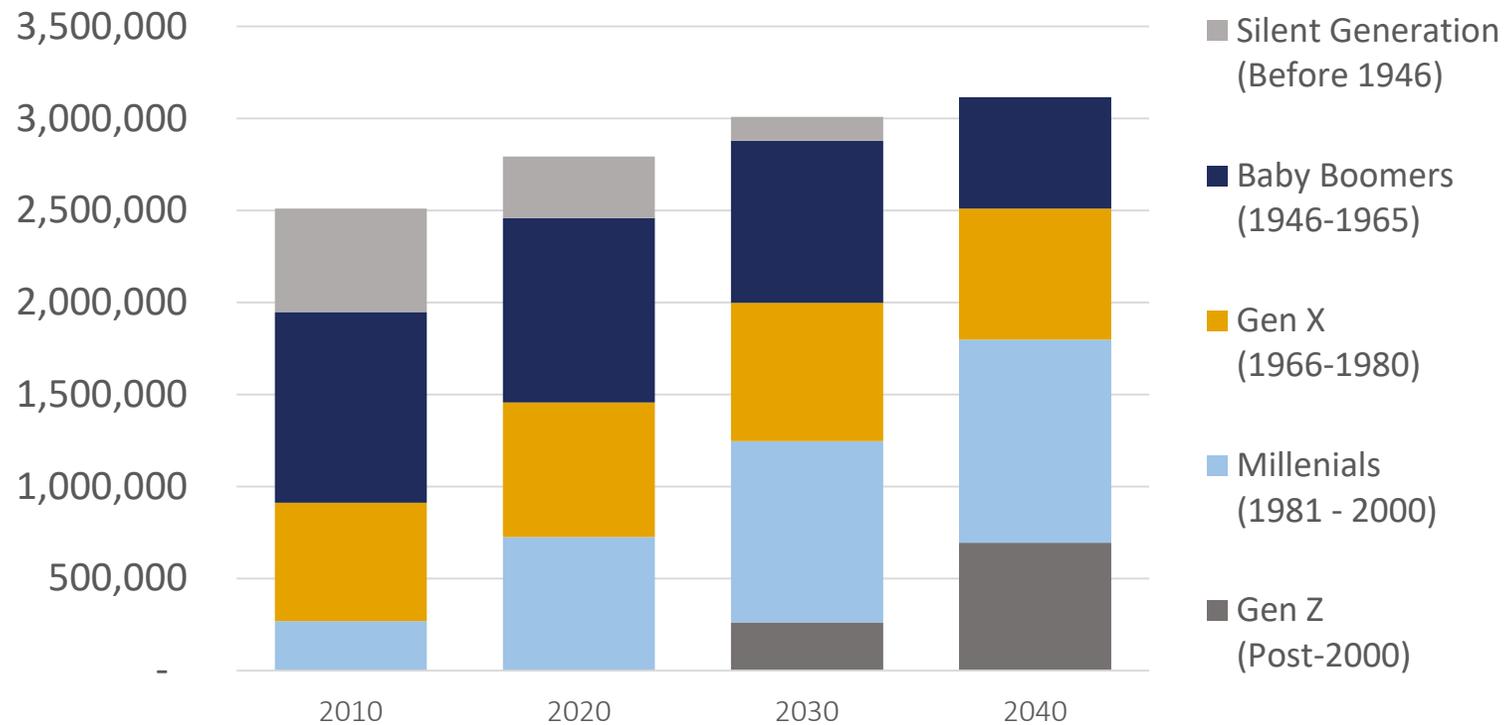
Massachusetts Projected Population Distribution by Age Group
2010-2040



Source Data: U.S. Census Bureau, 2010 Census Summary File 1; UMass Donahue Institute Population Projections 2018

By 2040, most households will be headed by someone born after 1980

Householders by Generation, Massachusetts, 2010 - 2040

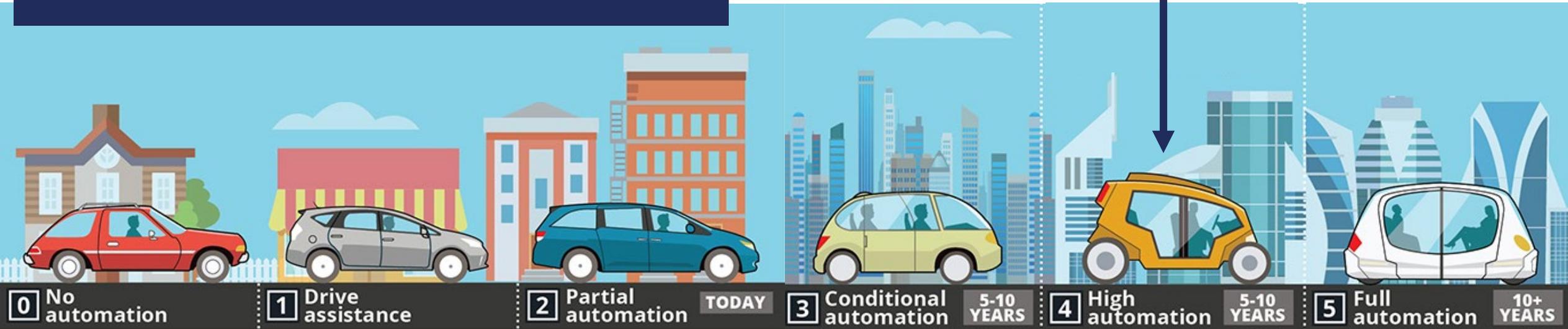


AV Technology: 5 levels of automation

“a fully-featured Google self-driving car might be 30 years away.” Chris Urmson SXSW 2016

Level 4 AV technology could be **19-75%** of vehicles by 2040.

Bansal and Kickelman “Forecasting American’s Long-term adoption of connected and autonomous vehicles technologies”, Transportation Research part A. 2017



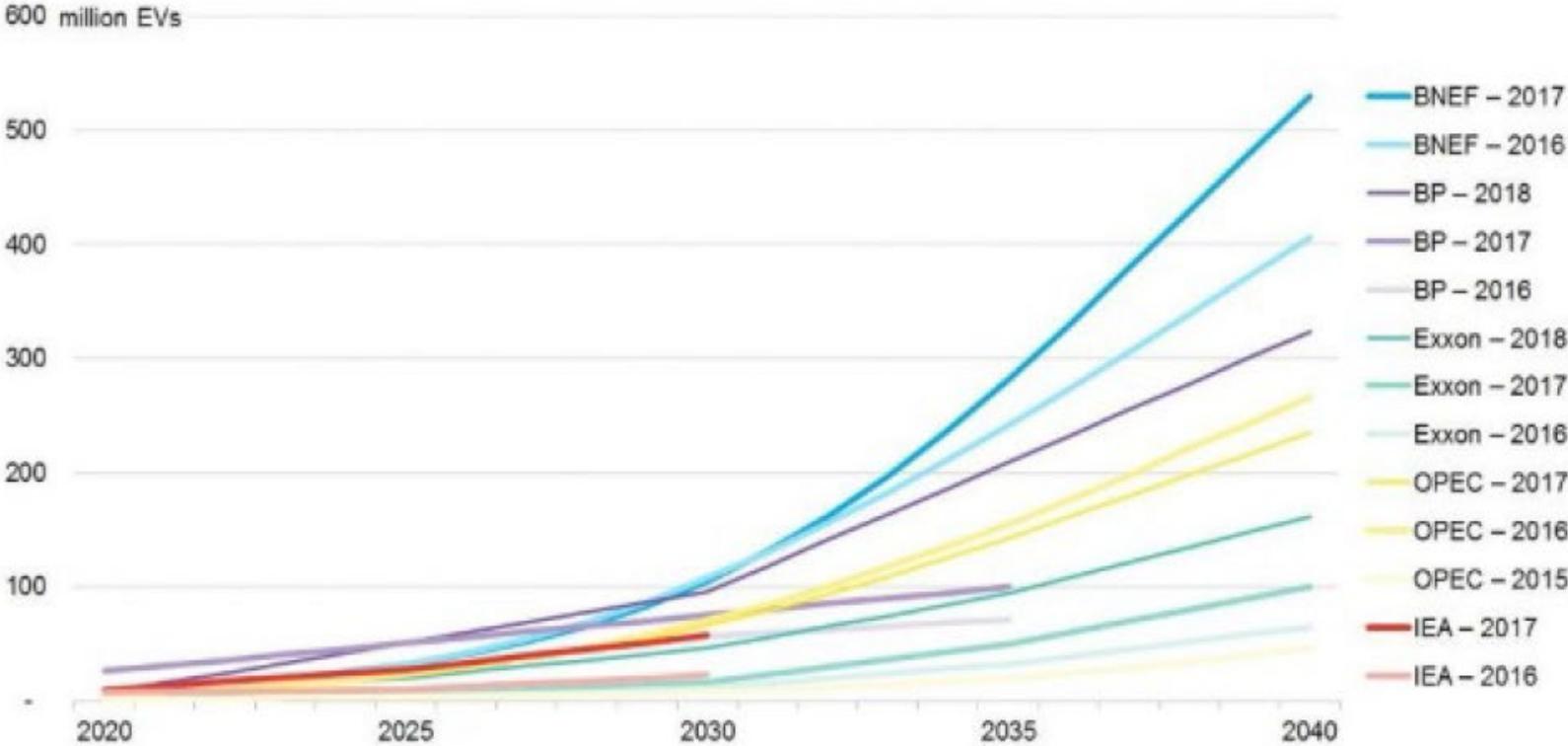
Facts/Trends/Developments:

- Cost and willingness to pay are the major economic forces behind technology adoption
- Full level 5 automation is more than 10 years away

Impacts

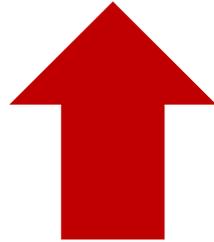
- Level 4 automation is an important consideration, where when and how might these vehicles be bounded

How Electric Vehicle Fleet Size Forecasts Have Changed Over Time



Massachusetts observed climate changes

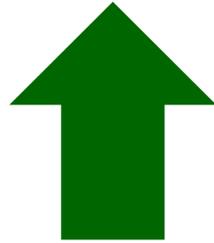
Temperature:



2.9°F

Since 1895 (Statewide)

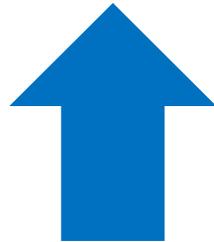
Growing Season:



15 Days

Since 1950

Sea Level Rise:



11 inches

Since 1922 (Boston)

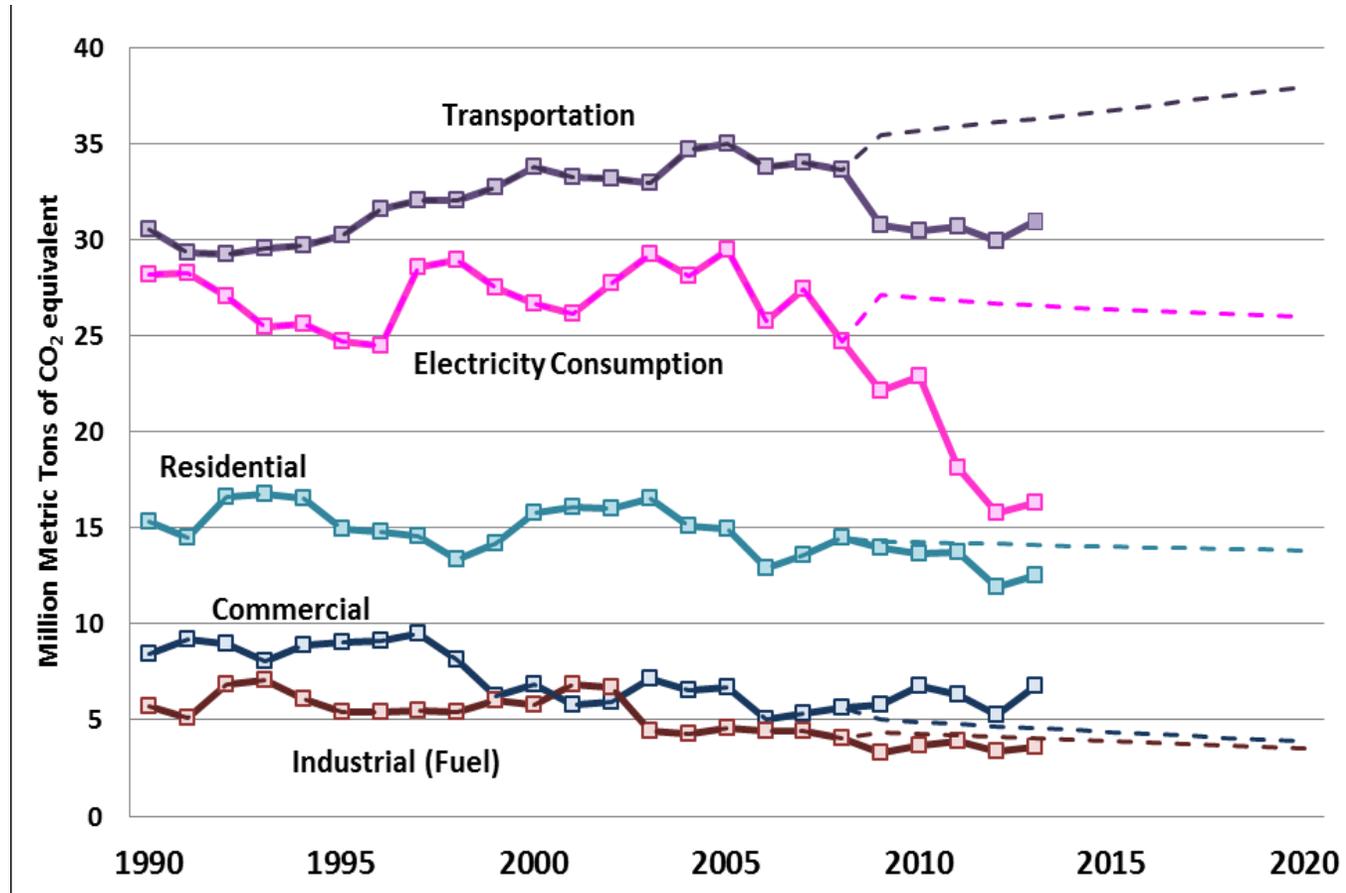
Heavy Precipitation:



55%

Since 1958

Transportation = largest share of CO₂ emissions



Ten Key Challenges

- 1) We can't know the future
- 2) Disruptive technological change is inevitable
- 3) Massachusetts is growing and aging
- 4) The existing transportation system is made up of transportation haves and have-nots
- 5) Transportation needs vary across the Commonwealth and its communities

Ten Key Challenges

- 6) The transportation system needs to move more people in fewer vehicles
- 7) Land use and development decisions drive transportation patterns
- 8) The transportation system needs to be de-carbonized
- 9) Transportation infrastructure needs to be made resilient to a changing climate
- 10) Needed investments need to be prioritized and paid for

Ila. Report Recommendations

Five Categories of Recommendations

- Modernize existing state and municipal transit and transportation assets to more effectively and sustainably move more people throughout a growing Commonwealth
- Create a 21st century “mobility infrastructure” that will prepare the Commonwealth and its municipalities to capitalize on emerging changes in transportation technology and behavior
- Substantially reduce greenhouse gas emissions from the transportation sector in order to meet the Commonwealth’s Global Warming Solutions Act (GWSA) commitments, while also accelerating efforts to make transportation infrastructure resilient to a changing climate
- Coordinate and modernize land use, economic development, housing, and transportation policies and investment in order to support resilient and dynamic regions and communities throughout the Commonwealth
- Make changes to current transportation governance and financial structures in order to better position Massachusetts for the transportation system that it needs in the next years and decades

1) Modernizing Existing Assets

- Recommendation #1: Prioritize investment in public transit as the foundation for a robust, reliable, clean, and efficient transportation system.
- Recommendation #2. State and municipal roadway design and operation should prioritize person throughput, rather than vehicle throughput, so that corridor capacity is allocated to moving as many people as possible.
- Recommendation #3: Work with multiple stakeholders to better manage today's traffic congestion – and the congestion challenges of the future.

2) 21st Century “Mobility Infrastructure”

- Recommendation #4: Establish a Commonwealth Transportation Technology Initiative.
- Recommendation #5: Support and Accelerate efforts to consume transportation differently.
- Recommendation #6: Promote a statewide telecommunications infrastructure.
- Recommendation #7: Develop a strategy to support connected and autonomous vehicles.
- Recommendation #8: Enable and promote a ubiquitous electric charging (and/or alternative fuel) infrastructure.

3) Greenhouse Gas Emissions & Resiliency

- Recommendation #9: Establish a goal that beginning in 2040, all new cars, light duty trucks, and buses sold in Massachusetts will be electric or use another technology that meets the same emissions standards.
- Recommendation #10: Collaborate with other Northeast and Mid-Atlantic states to establish a regional, market-based program to reduce transportation sector greenhouse gas (GHG) emissions.
- Recommendation #11: Make all current and future critical state and municipal transportation infrastructure resilient to a changing climate.
- Recommendation #12: Ensure that sufficient electric capacity is available to provide reliable, clean, and competitively priced power supplies for all electricity users as electrification of the transportation sector accelerates.

4) Land Use/Development/Housing Coordination

- Recommendation #13: Adopt dense, mixed-use and transit-oriented policies.
- Recommendation #14: Enable Gateway Cities and the regions they anchor to compete for residents and jobs.
- Recommendation #15: Coordinate the planned reinvention of the MBTA commuter rails system with local, regional and state land use and economic development strategies.
- Recommendation #16: Provide better mobility options in rural communities.

5) Finance And Governance Structures

- Recommendation #17: Prepare MassDOT and other transportation-related entities to effectively oversee a changing transportation system.
- Recommendation #18: Develop a fiscally sound and responsible transportation resource plan.

III. Use of Scenario Planning

IT'S EASY TO GET THE FUTURE WRONG

THOMAS WATSON 1943

Chairman of IBM

**“I think there is a
world
market for maybe
five computers.”**



CHANGE HAPPENS FAST

5th Avenue
New York
City

1900

WHERE
IS THE
CAR?



5th Avenue
New York
City

1900

WHERE
IS THE
CAR?



5th Avenue
New York City

1913

WHERE
IS THE
HORSE?



5th Avenue
New York
City

1913

WHERE
IS THE
HORSE?



HOW TO NAVIGATE AN UNCERTAIN FUTURE





Use Scenario Planning



A shift from prediction to preparation



TODAY

PLANNING HORIZON



POINT FORECAST

Planning for a short term point in time.



FUTURE SCENARIO PLANNING

Looking out decades and letting the future drive the planning.



Future Scenario 1

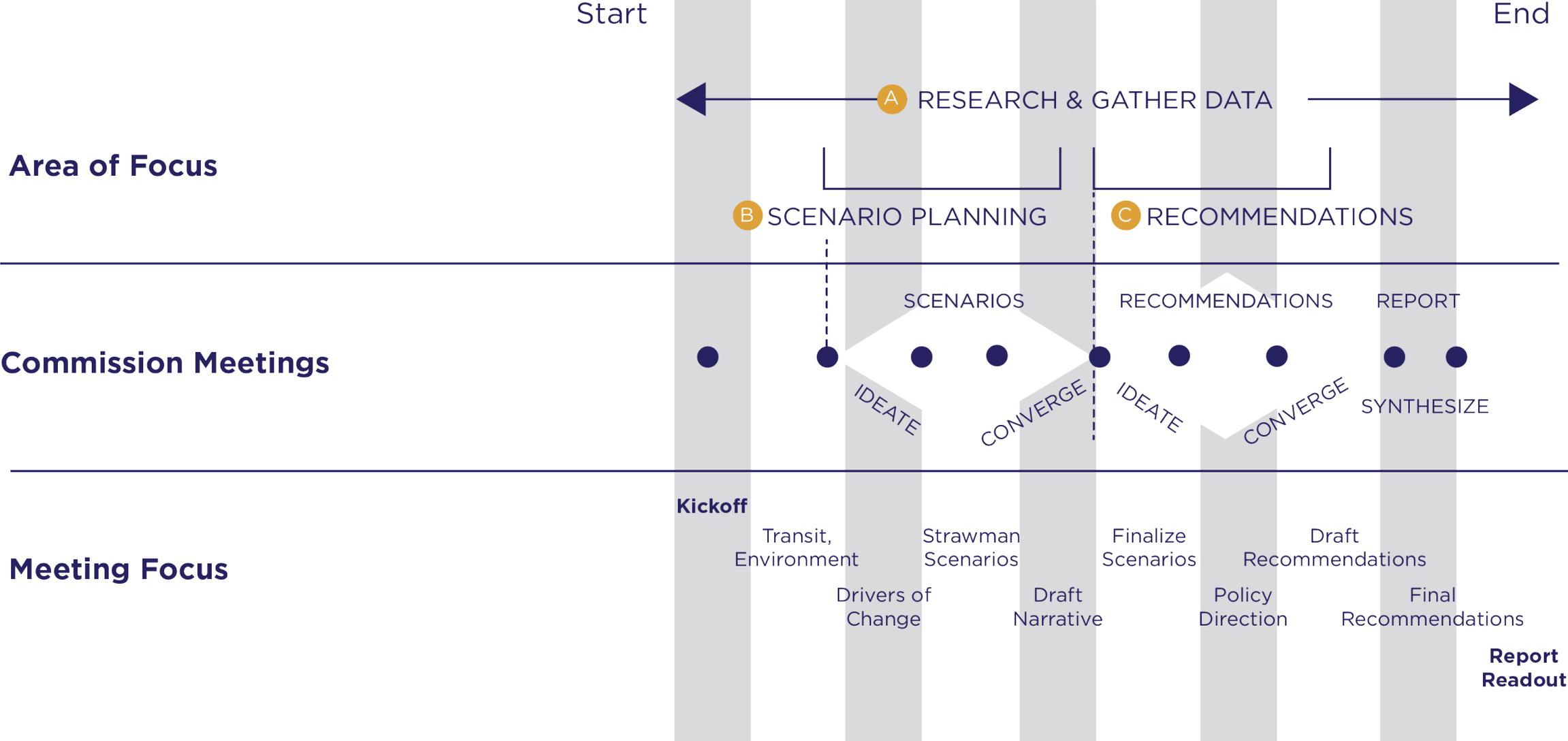


Future Scenario 2



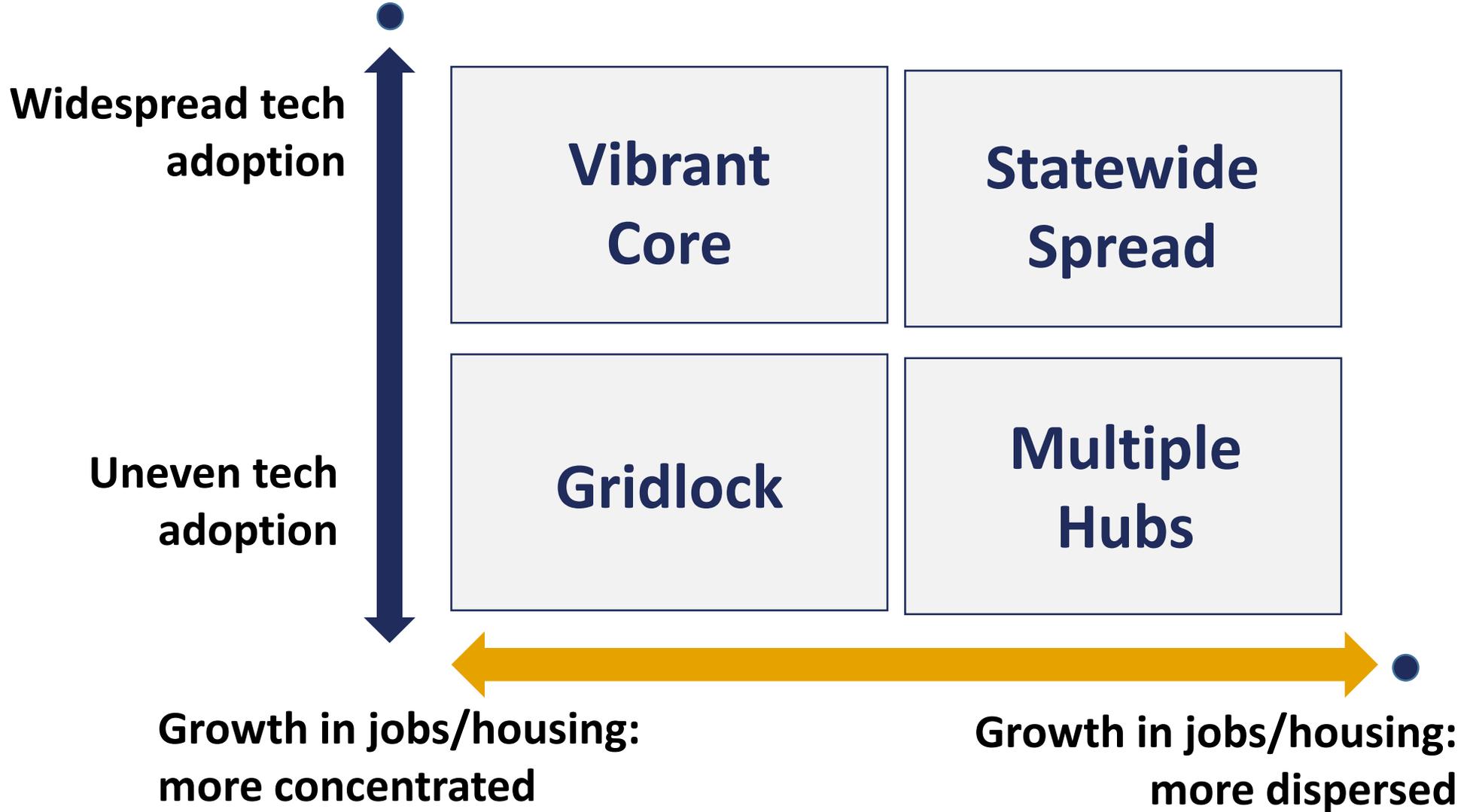
Future Scenario 3

MASS. SCENARIO PLANNING PROCESS OVERVIEW



SCENARIO DRIVING FORCES CONSIDERED BY MASSACHUSETTS COMMISSION ON FUTURE OF TRANSPORTATION:

- Demographics & land use
- Transit, active transportation, & mobility services
- Connected & autonomous vehicles
- Climate change & resilience
- Transportation electrification



Gridlock

Fast growth of Boston and its surrounding municipalities has continued, but without expansion of existing transportation capacity:

- Jobs and housing growth mostly in Greater Boston
- Ride-sharing, vehicle-sharing less convenient, reliable, or available than projections
- Choking traffic congestion and unreliable transit cause residents and employers to seek opportunities outside Greater Boston/the state.
- Cost of housing and commercial property push people and businesses to edges of core and beyond
- Some rural communities located far from Boston shrink as they lose working age population

Vibrant Core

Greater Boston continues to grow, supported by new transportation technologies and systems that facilitate a vibrant and livable region:

- Jobs and housing growth mostly in Boston's core and close-in communities, especially those with MBTA service. Some rural communities located far from Boston shrink
- Ubiquitous adoption of technology advances in C/AVs and electric vehicles, supported by a clean energy grid, combined with a shared approach to MaaS, support a vibrant, livable, and mobile core on target to meet GHG and related goals
- Reliable public transit, MaaS, and micro-mobility options provide trips around the core and beyond

Multiple Hubs

High-density growth takes place in several cities and their regions throughout the Commonwealth:

- Commerce and housing generally concentrates at cores of regional hub cities
- Adoption of C/AV and MaaS with travel by shared rides serves lower density hubs and travel between them. Outside these regions, transportation tech and mobility options limited due to long-standing infrastructure challenges and aging populations
- Economic development distributed throughout the state; most communities not far from opportunities for jobs, education, shopping, etc.
- Growth in vehicle miles traveled (VMT) raises concerns for safety where C/AVs meet human drivers and pedestrians

Statewide Spread

Tech has transformed not just transportation but every aspect of people's lives, including work, communication, commerce, and service delivery; allows more choice for those with access to tech, while potentially disadvantaging others:

- Significant technology advances (tele-work, tele-med, drones, robotics, AI) impact how we work and how services and things are provided
- On plus side, technology provides individuals with means and businesses unprecedented access and wider choice of location
- However, individual AV car ownership is high and dispersed populations are difficult to serve by MaaS or public transit.
- Social equity is a major concern as many seniors and people with lower incomes are “stranded” in place

BRAINSTORM POLICY RECOMMENDATIONS

Strategy works in all futures	Immediate <i>current or near-term need</i>	
	Robust <i>no brainers</i>	
Strategy works in some futures	Deferred <i>no regret</i>	Leap forward <i>influence the future</i>
		Hedging <i>potential regret</i>
Strategy works in no futures	Dropped	

ATTRIBUTES OF GOOD SCENARIO PLANNING

Avoid too much complexity by having four or fewer scenarios

Challenge conventional wisdom about the future

Present dramatically different visions

Avoid a preferred scenario, “heaven & hell” contrasts, or a ‘business as usual’ scenario.

WHAT MAKES A GOOD SCENARIO?

Plausible—Users must believe scenario grows from the past to the future. A scenario with “save the world” technology, for example, may feel unrealistic.

Internally Consistent—The logic in a scenario should be consistent. One aspect of the scenario cannot contradict others.

Memorable— Scenarios should be easy to recall. Names should be descriptive and catchy. They will become touchstones for future conversation.



Practical Tips – Scenarios are a means to an end

- Use scenarios to start talking about futures
- Focus on recommendations you can offer that work across scenarios

Scenarios are your sandbox to develop recommendations

- What kinds of transportation systems will be needed in each scenario?
- How might your DOT need to be reshaped to deliver those systems?
- What investment strategies might be needed?
- What other sorts of policies might be needed?



IV. Summary of Lessons Learned, Insights, and Commissioner Perspectives

Today's Participants

- Joe Crossett, *High Street Consulting*, crossett@highstreetconsulting.com
 - Rebecca Davis, *Metropolitan Area Planning Council*, rdavis@mapc.org
 - Elizabeth Williams, *Massachusetts Department of Transportation*, elizabeth.e.williams@state.ma.us
 - Steve Woelfel, *Massachusetts Department of Transportation*, steve.woelfel@state.ma.us
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Panelists Presentations

<http://onlinepubs.trb.org/onlinepubs/webinars/190911.pdf>

After the webinar, you will receive a follow-up email containing a link to the recording



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