



**A
BETTER
CITY**



**SUSTAINABLE
BUILDINGS
INITIATIVE**

CARBON FREE BOSTON

FINDINGS & NEXT STEPS

FEBRUARY 12, 2019

#CarbonFreeBoston

@ABetterCity @BosGreenRibbon





WELCOME

RICK DIMINO

PRESIDENT & CEO, A BETTER CITY

#CarbonFreeBoston

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INTRODUCTION OF CARBON FREE BOSTON

AMY LONGSWORTH

DIRECTOR, BOSTON GREEN RIBBON COMMISSION

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FINDINGS FROM THE CARBON FREE BOSTON REPORT

MICHAEL WALSH

SENIOR RESEARCH SCIENTIST, INSTITUTE OF SUSTAINABLE ENERGY

BOSTON UNIVERSITY



NEXT STEPS

ALISON BRIZIUS

DIRECTOR OF CLIMATE CHANGE & ENVIRONMENTAL PLANNING

CITY OF BOSTON ENVIRONMENTAL DEPARTMENT

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Carbon Free Boston

12 February, 2019

People and Process



Expert Advisory Groups

- Buildings
- Transportation
- Waste
- Energy
- Social Equity

Steering Committee

Other organizations



Boston University Institute for Sustainable Energy

- Technical and Support Staff
- Consultants



Carbon Free Boston Report



Green Ribbon Commission



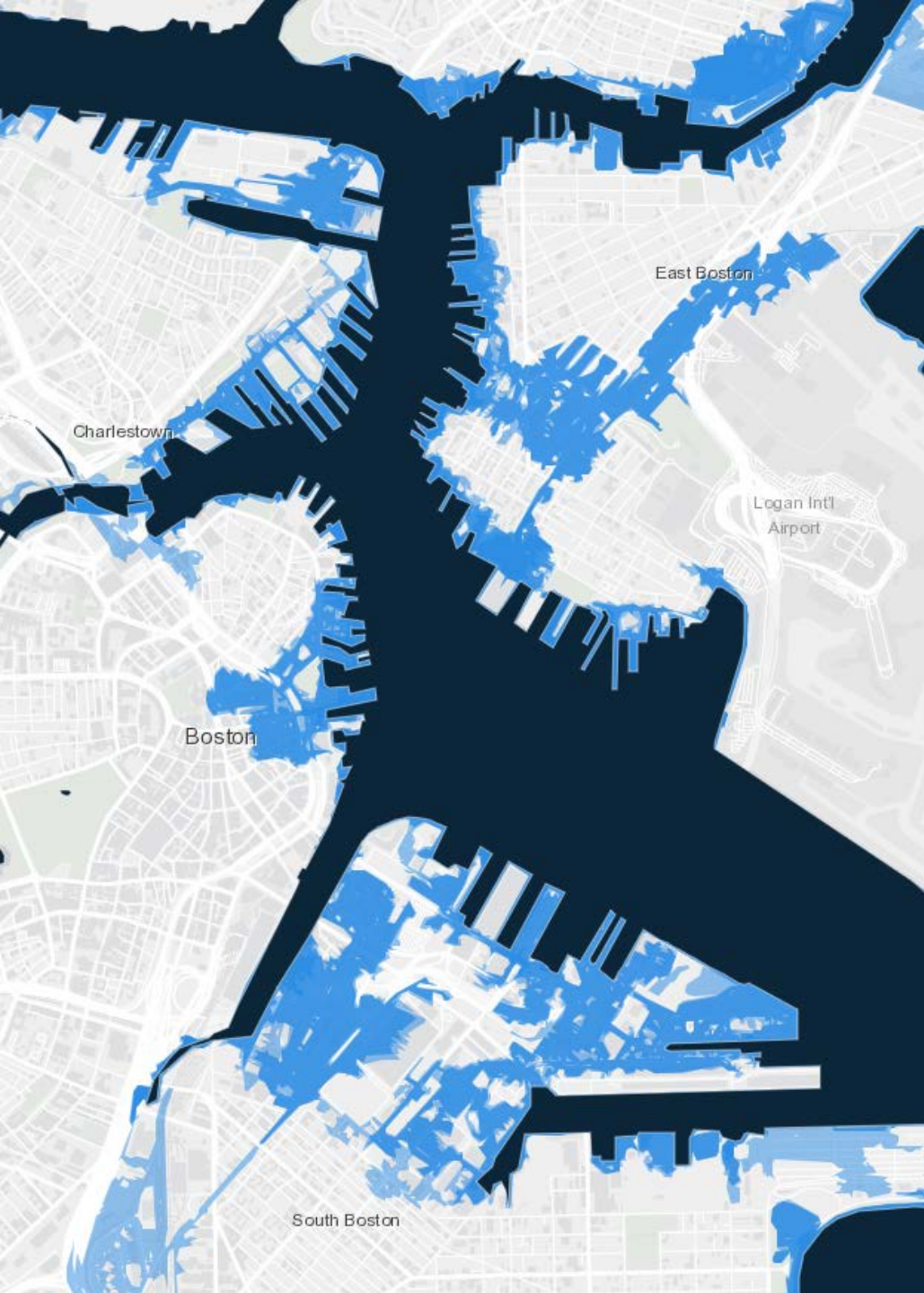
City of Boston

Funders and CFB Working Group

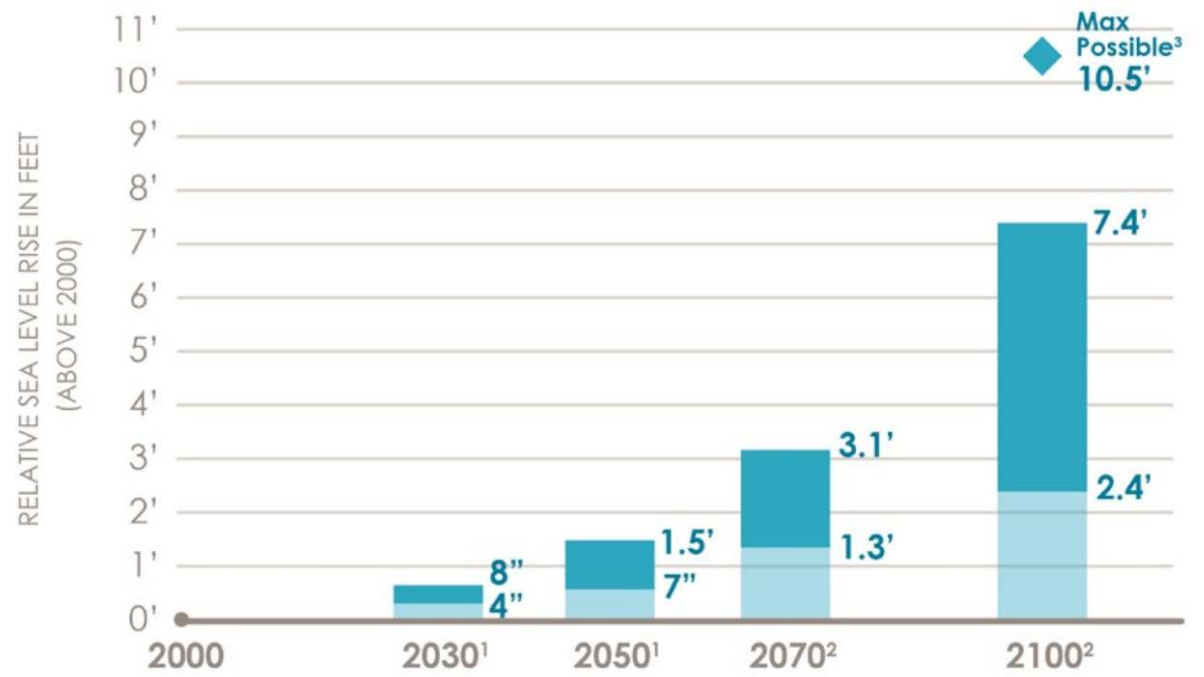


CFB Working Group

- Mindy Lubber, Ceres (Chair)
- Robert Brown, Boston University
- Bill Fahey, Veolia
- Joe Grimaldi, Mullen Lowe
- Amos Hostetter, Barr Foundation
- Katie Lapp, Harvard
- Alex Liftman, Bank of America
- Penni Mclean-Conner, Eversource
- Marcy Reed, National Grid
- Israel Ruiz, MIT

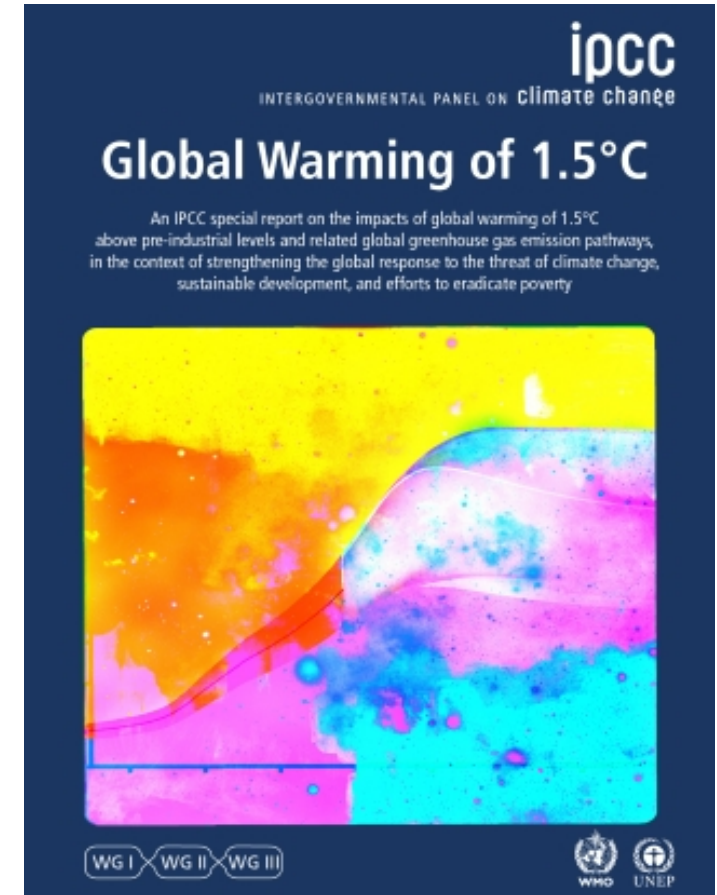
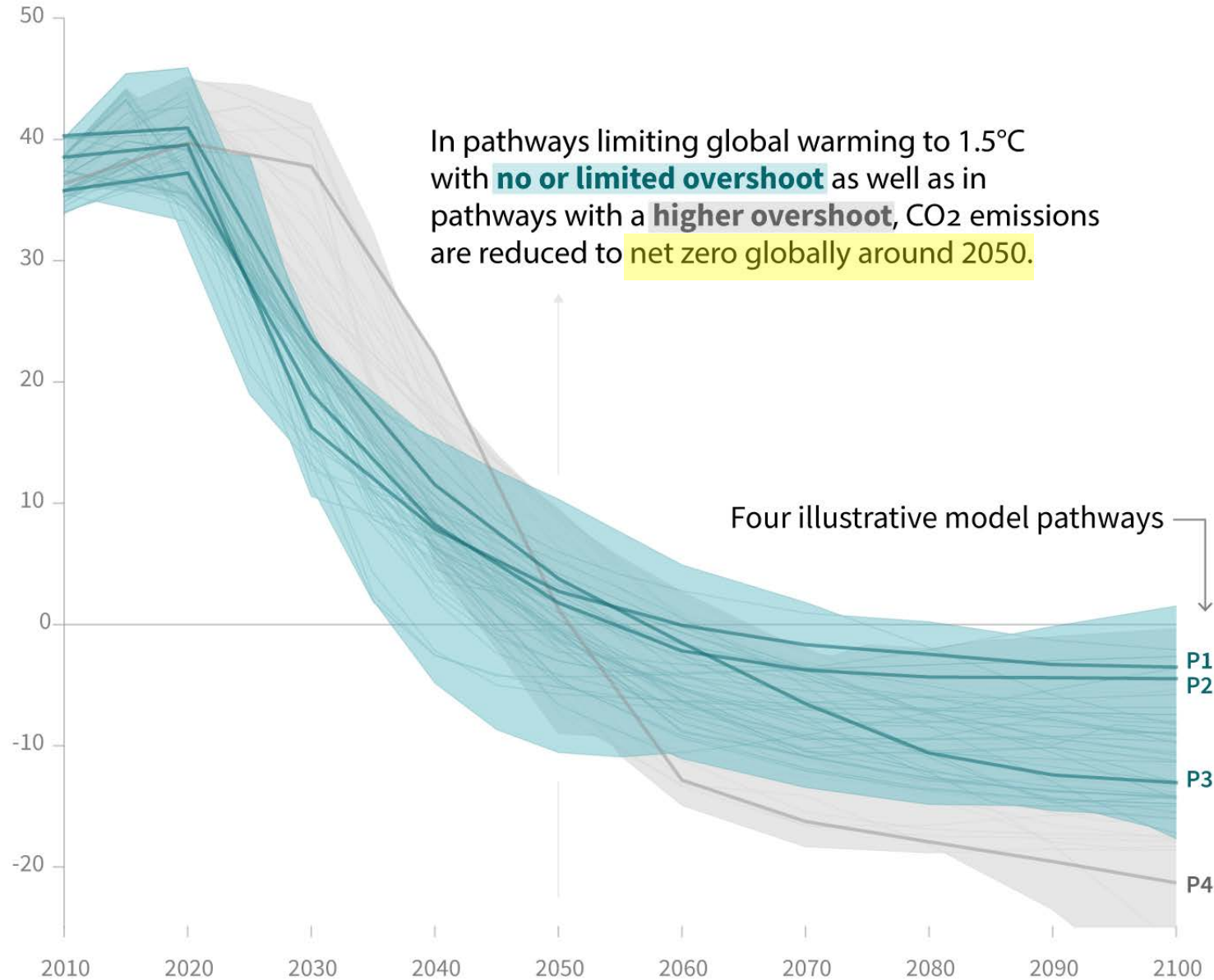


SEA LEVELS IN BOSTON WILL CONTINUE TO RISE



Global total net CO₂ emissions

Billion tonnes of CO₂/yr



Three Mutually Reinforcing Strategies Must Be Pursued Together



Reduce demand for energy and deepen energy efficiency

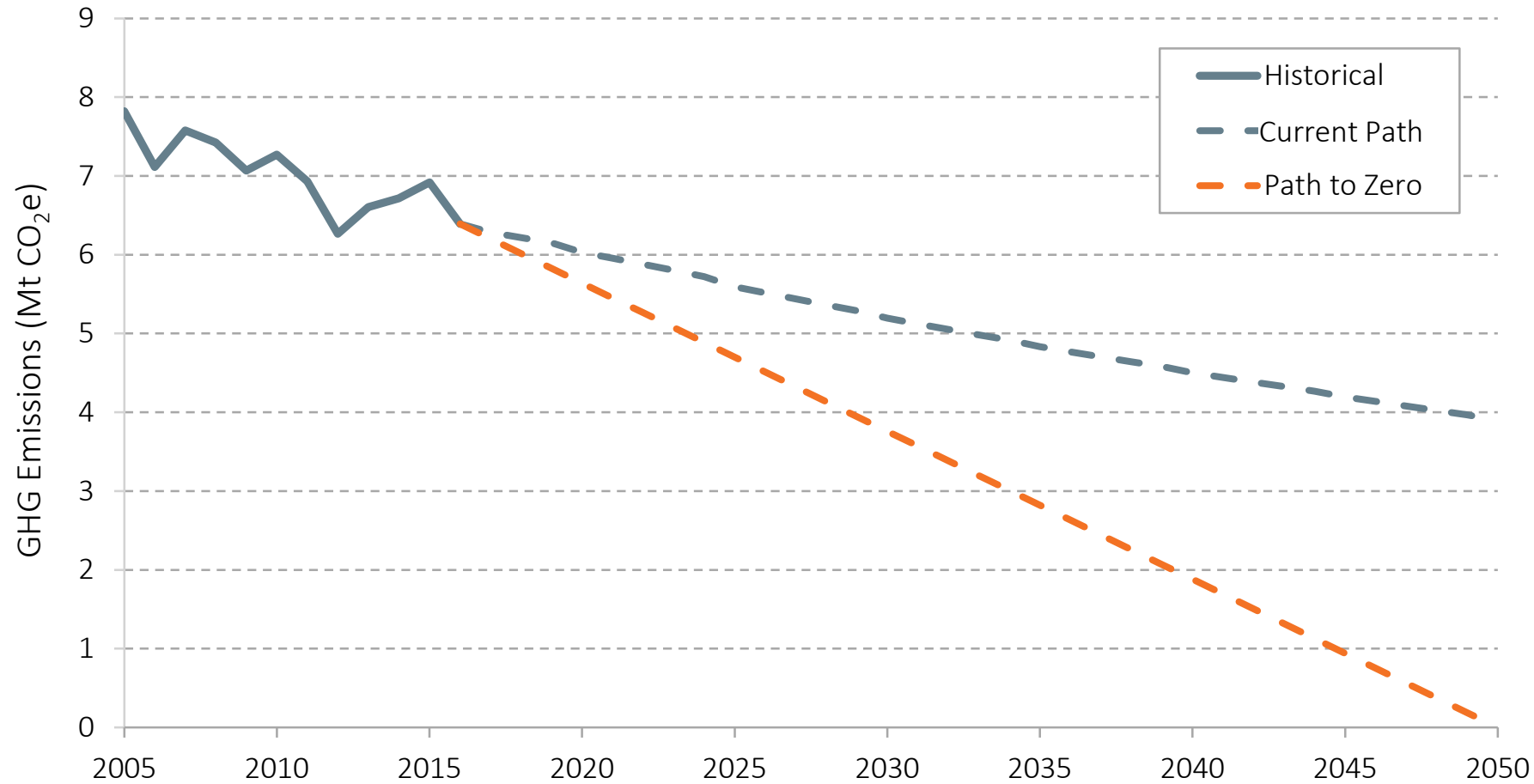


Electrify all energy services to extent practicable



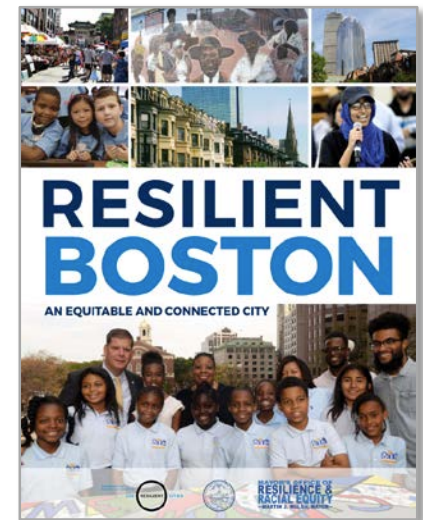
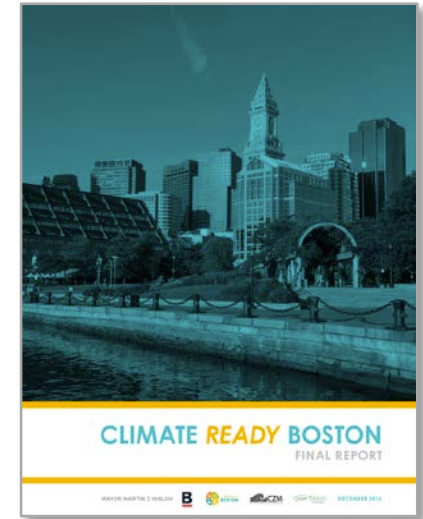
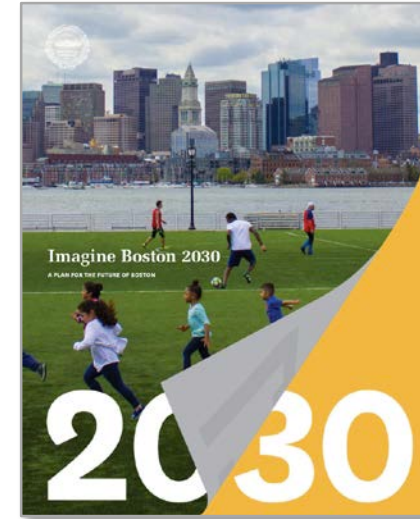
Purchase 100% clean electricity

Carbon Neutrality Requires Decisive Action

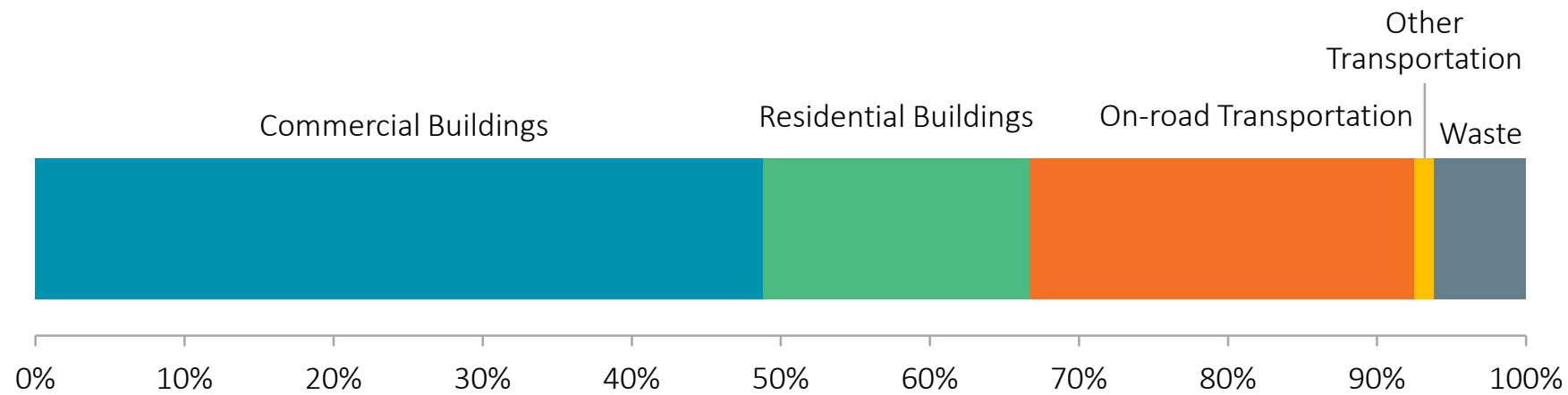
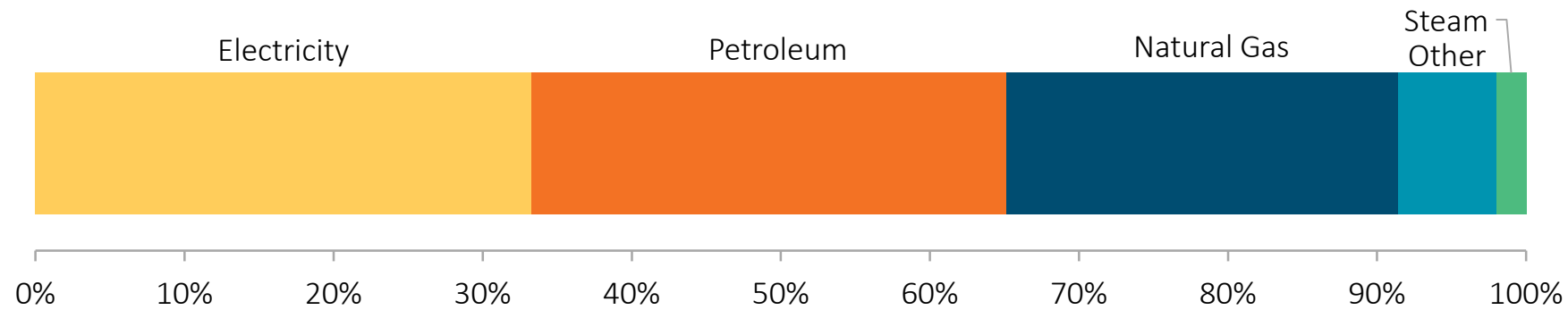


Qualities of a Carbon Neutral Boston

- Encourages Growth
 - Urban lifestyles are more sustainable
 - Creates opportunities for affordable housing
 - Green innovation and job growth
- Couples mitigation with resilience-building
 - Healthier homes, workplaces and streets
 - Protects vulnerable communities
- Strategically invests for maximum returns
 - Prioritize the most effective strategies
 - Reduce energy costs in the long term



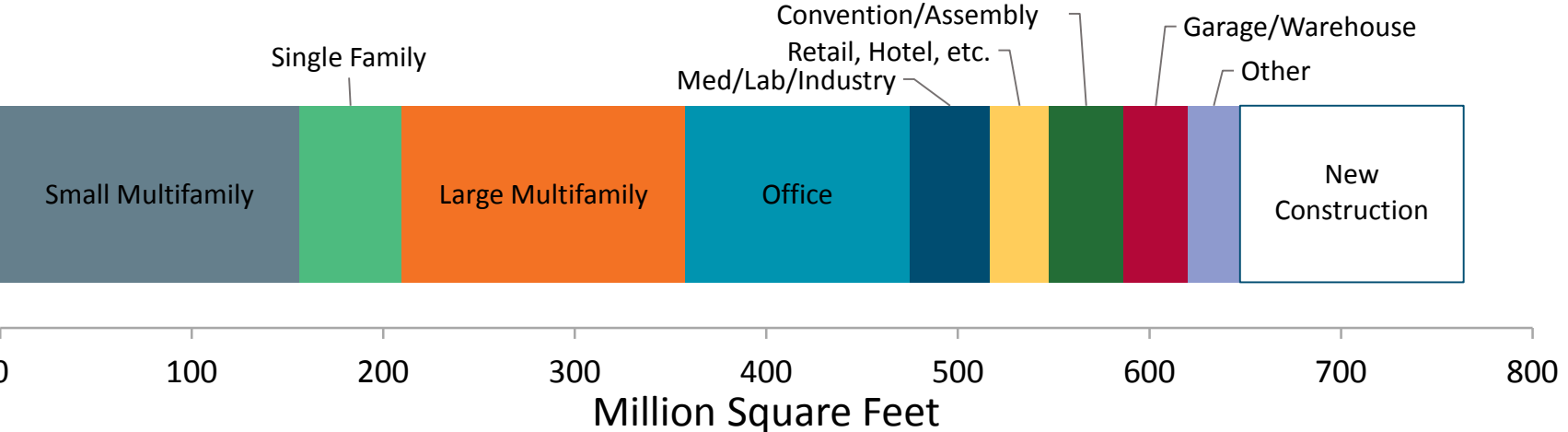
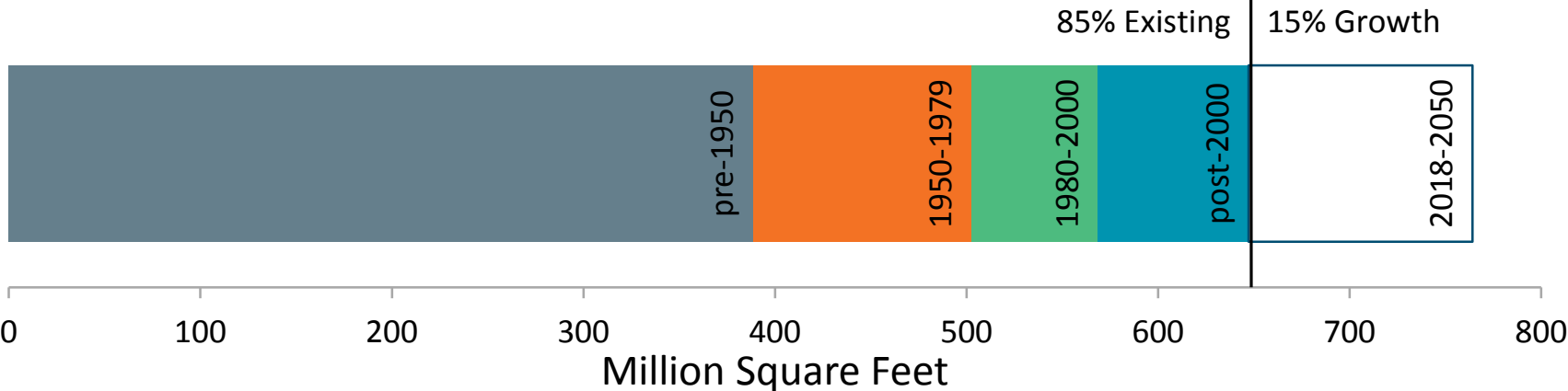
Fossil Fuels Dominate GHG Emissions in 2016





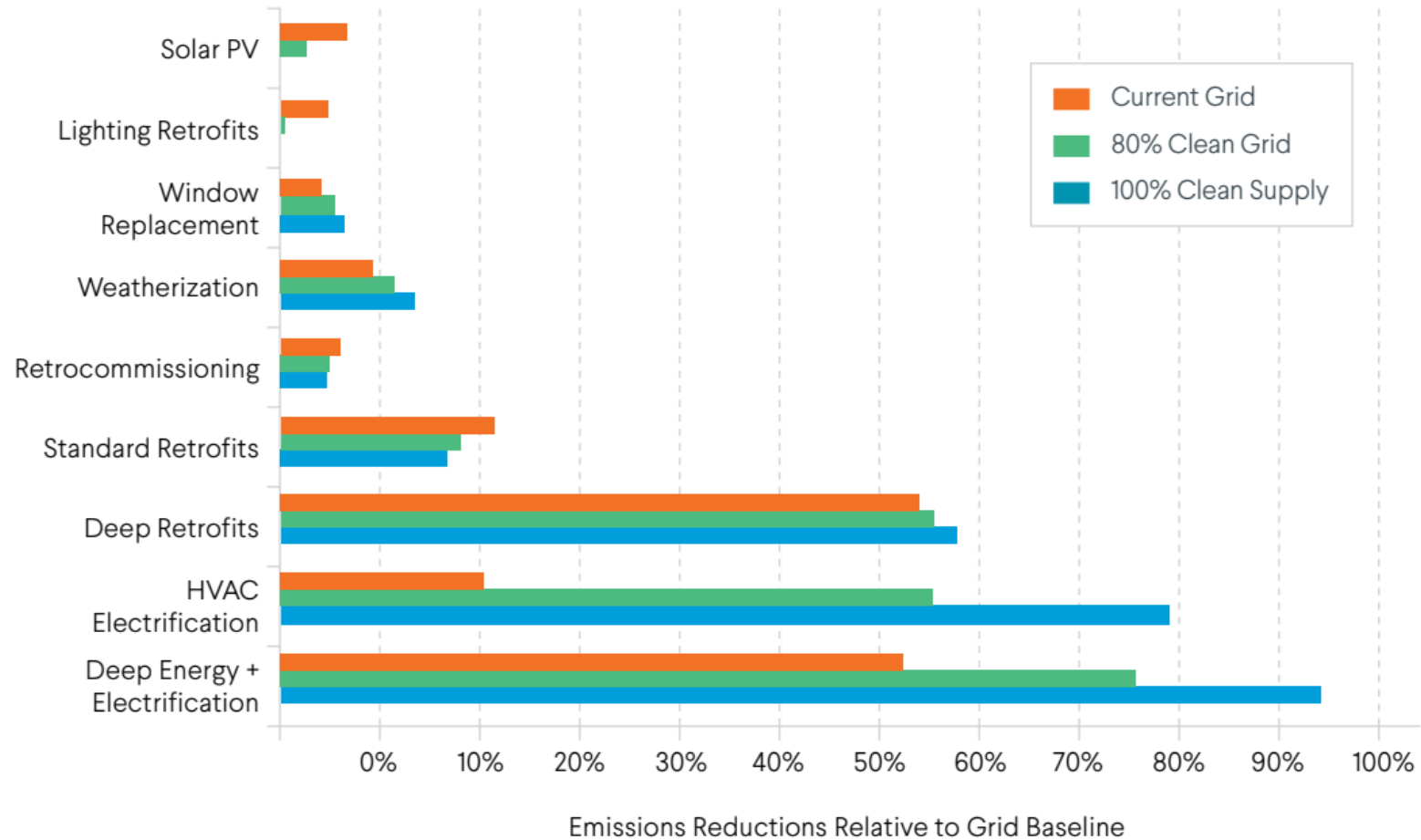
Buildings

Boston's Building Stock is Old, Diverse, and Inefficient



Residential Buildings = 77,000
Commercial Buildings = 10,000

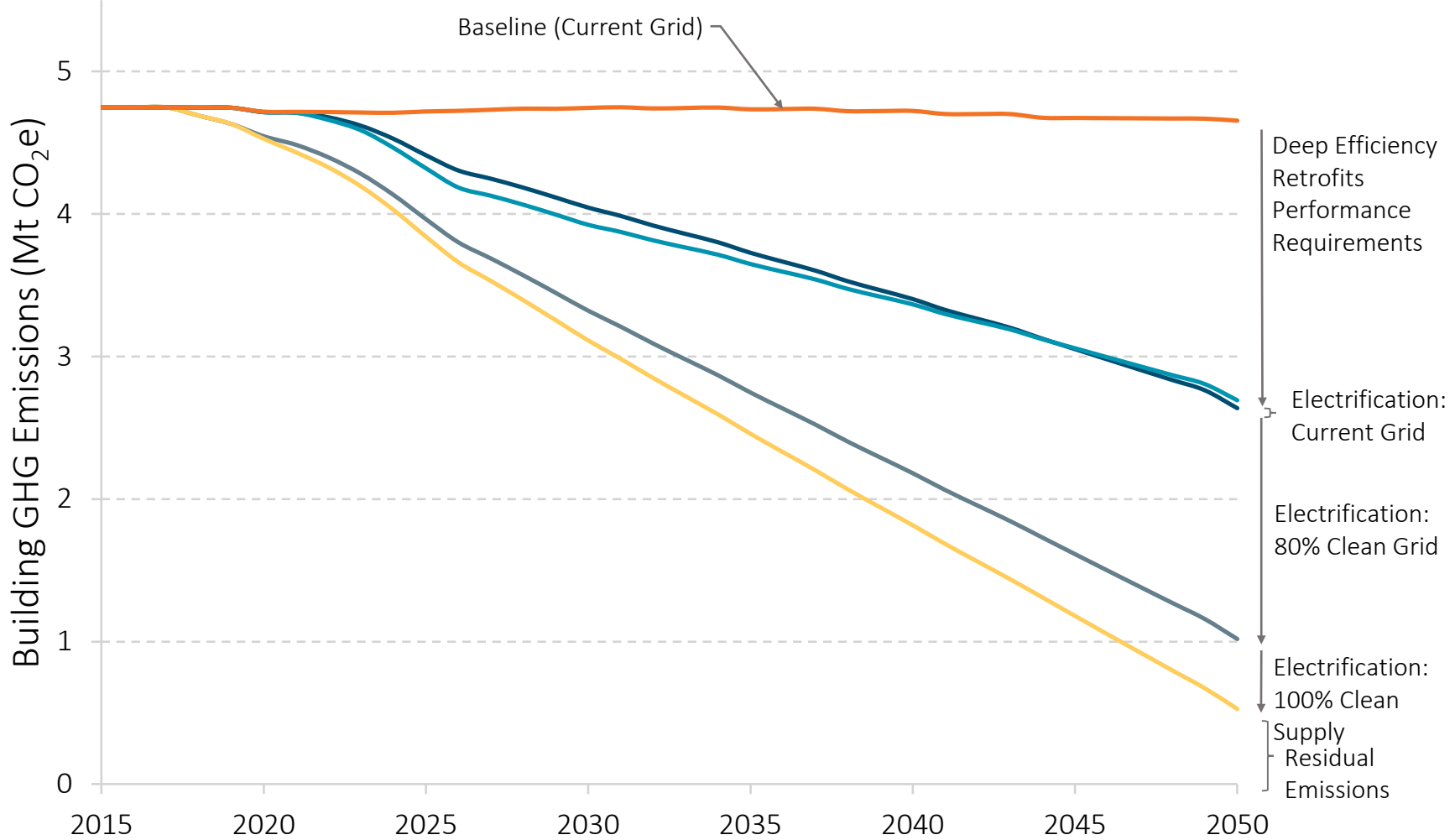
Comprehensive Measures are Needed to Reduce Emissions



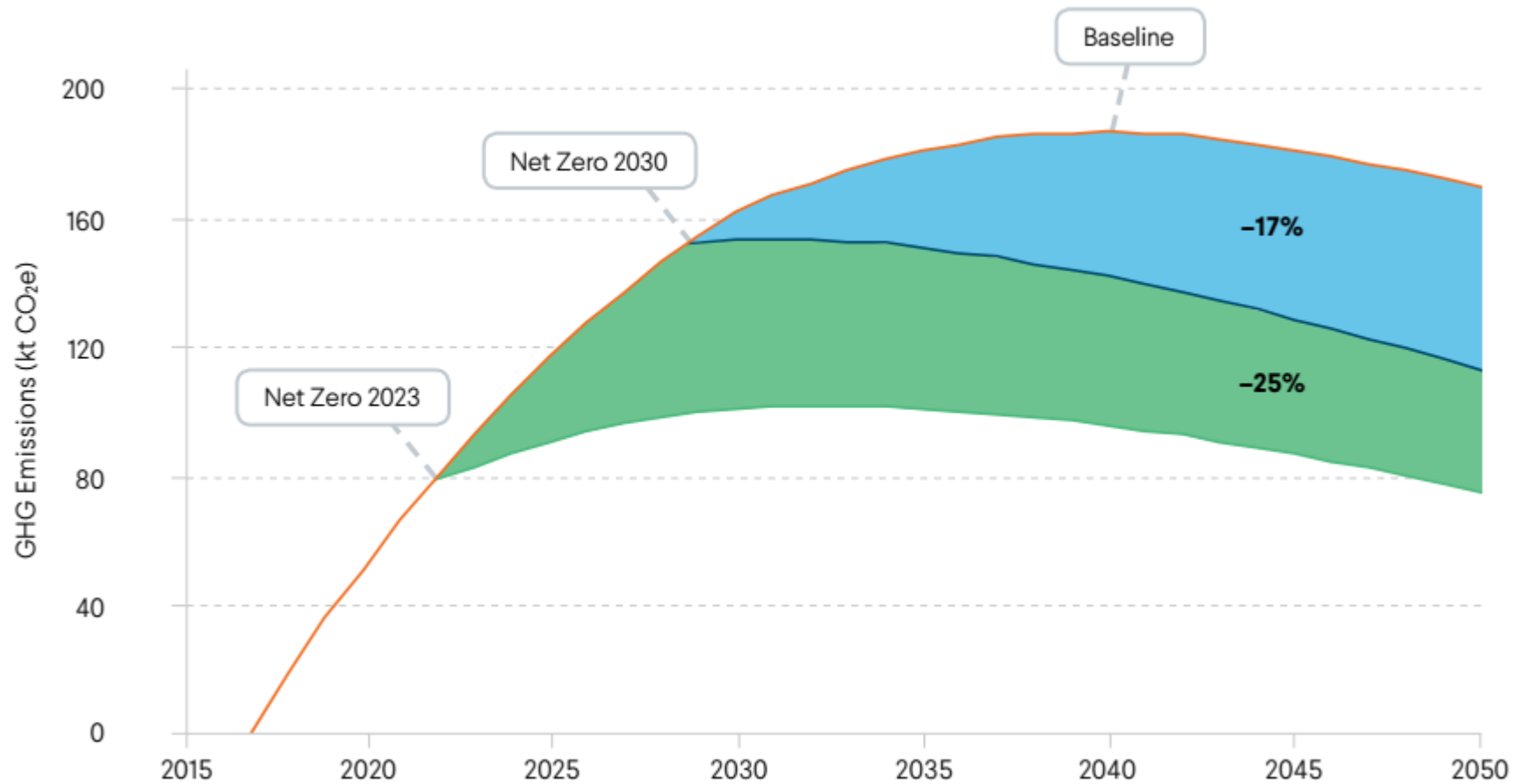
Summary of Building Options

Strategy	Policy Mechanisms	Comments
Thermal Electrification	Incentives and/or mandates	<ul style="list-style-type: none">▪ Large GHG reduction▪ Infrastructure cost reduced when coupled with efficiency▪ Requires financing and technical assistance
Energy Conservation Measures	Incentives	<ul style="list-style-type: none">▪ Low-hanging fruit▪ Low GHG reduction
Performance Requirements	BERDO Expansion	<ul style="list-style-type: none">▪ Flexibility for owners▪ Low cost compared to mandates
Deep Energy Retrofits	Requirement with sale or major renovation	<ul style="list-style-type: none">▪ Large GHG reduction▪ Policy is complex with many barriers
Low Energy New Construction	Code / Planning Requirements	<ul style="list-style-type: none">▪ Low-hanging fruit▪ Avoids lock-in▪ Modest GHG reduction

Path to Carbon-Neutrality in Buildings



Policy Timing Matters: New Construction



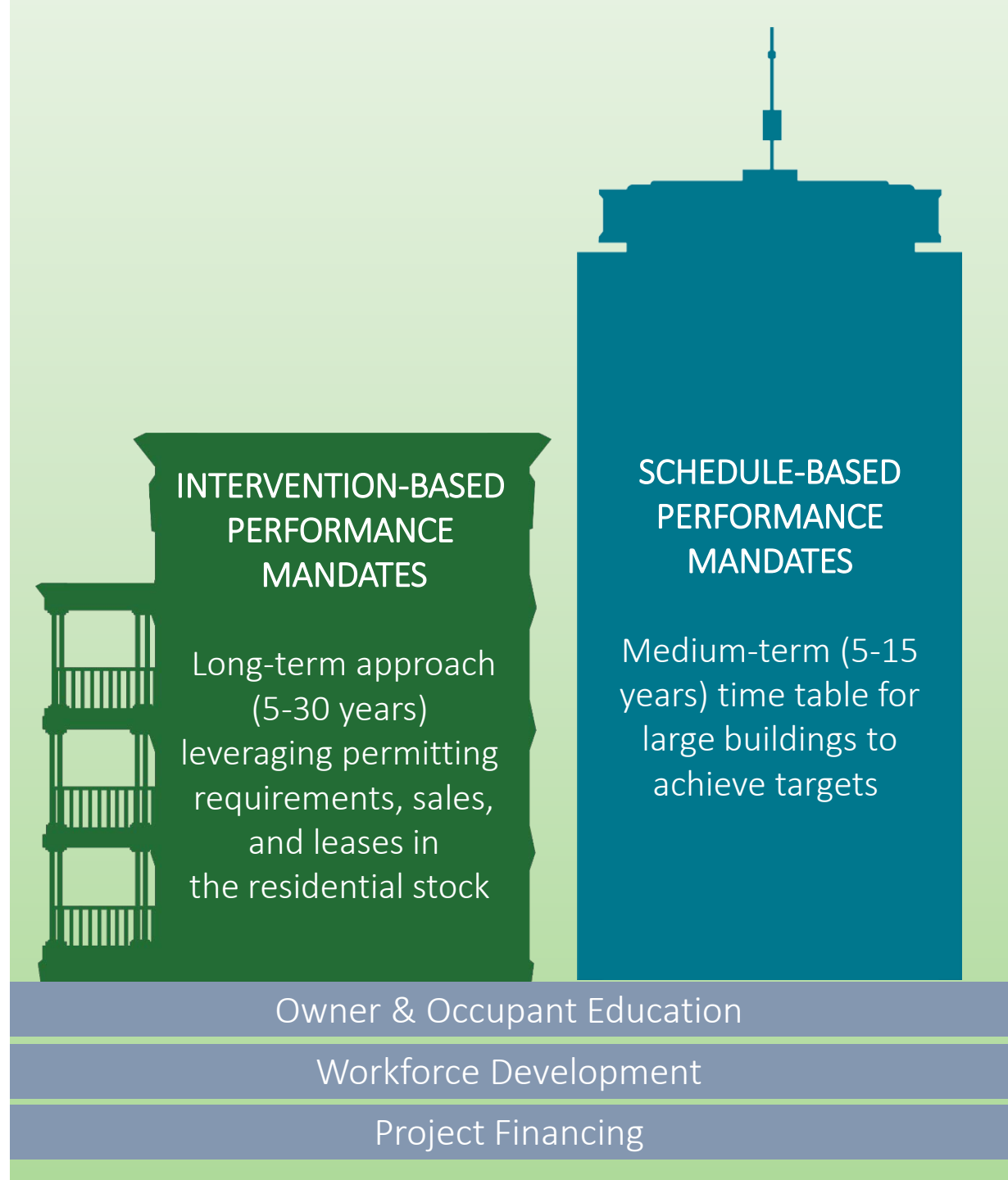
Policy Needs: Existing

BUSINESS AS USUAL

- Modest reductions in building energy use
- Slow pace of implementation
- Fossil fuels still widely used for heating
- *Carbon neutrality goal unachievable*

TARGETED DEEP RETROFIT & ELECTRIFICATION REQUIREMENTS

- 40%-50% EUI reduction targets by building class
- Eliminate fossil fuel use
- *Carbon neutrality within reach*



Cutting Emissions Improves Health, Affordability, and Resiliency

Benefits

75% reduction in harmful air pollution in 2050

\$ 600 million in energy cost savings in 2050

Health benefits from improved indoor air quality

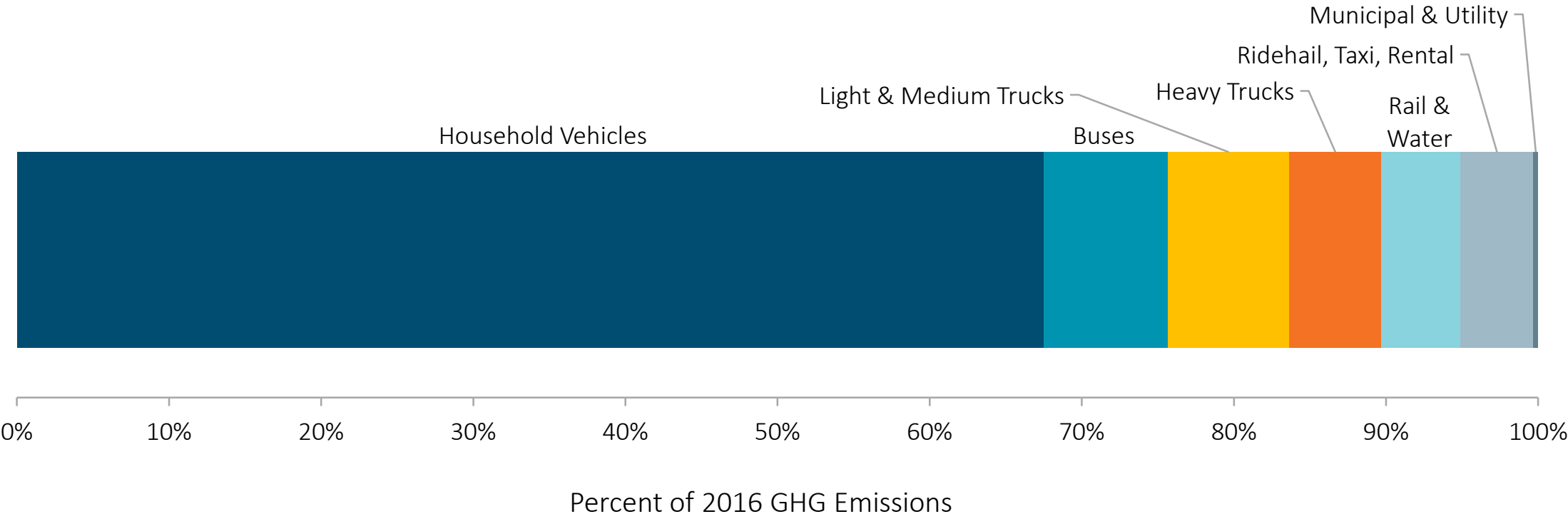
Economic stimulus (disposable income, jobs, asset value)

Enhanced climate resiliency

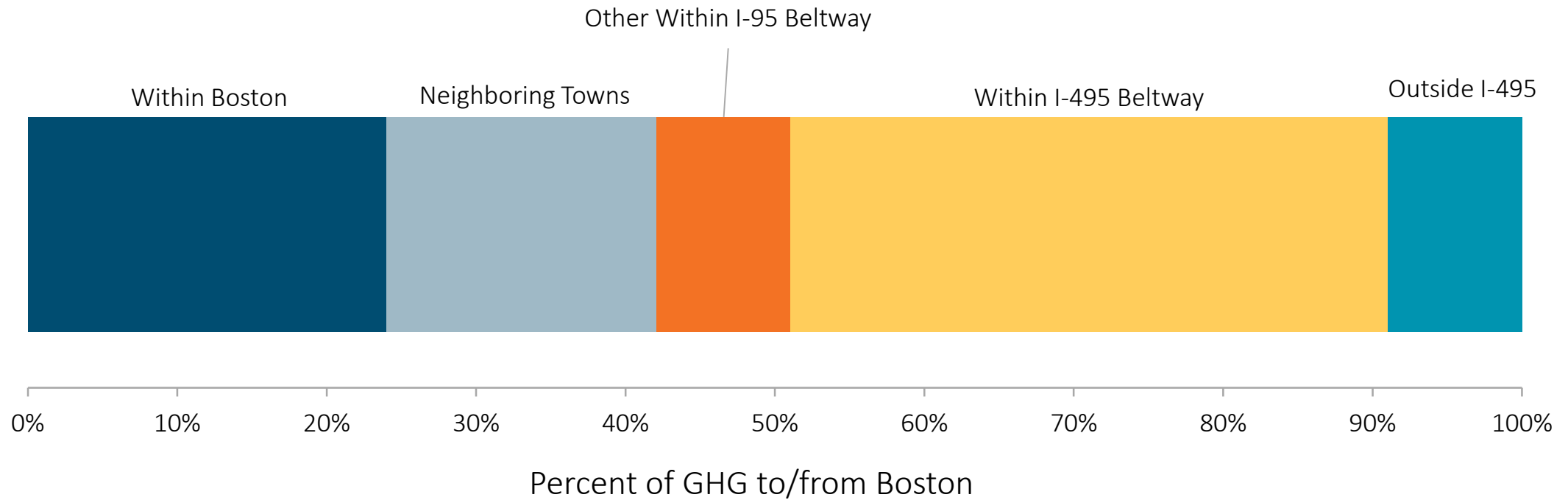


Transportation

Personal Vehicles Drive GHG Emissions



Long Trips Drive GHG Emissions



Summary of Transportation Options

Strategy		Policy Mechanisms	Comments
MODE SHIFT	Improved Transit	<ul style="list-style-type: none"> 100% electric Expanded BRT & Light Rail 	<ul style="list-style-type: none"> Low GHG reduction Many non-GHG benefits Essential for an equitable, connected, and resilient city
	Free/reduced cost transit	<ul style="list-style-type: none"> Free for walk-access transit 50% reduction for drive-access 	
	Walking & Biking	<ul style="list-style-type: none"> Citywide bike lane & walking improvements 	
	Trip Pricing	<ul style="list-style-type: none"> Cordon/Congestion Fee Parking Fee VMT Fee 	
	Shared mobility	<ul style="list-style-type: none"> Fee for ride alone Subsidy for pooled ride 	
AUTONOMY	Connected Autonomous Vehicles	<ul style="list-style-type: none"> Requires regulatory framework 	<ul style="list-style-type: none"> Uncertain GHG impact Likely to increase VMTs
ELECTRIFICATION	Electric Vehicles	<ul style="list-style-type: none"> Drive market transformation Create infrastructure Prohibit fossil fuel vehicles 	<ul style="list-style-type: none"> Large GHG reduction Requires partnerships with state Requires extensive charging infrastructure

Ambitious Mode Shift

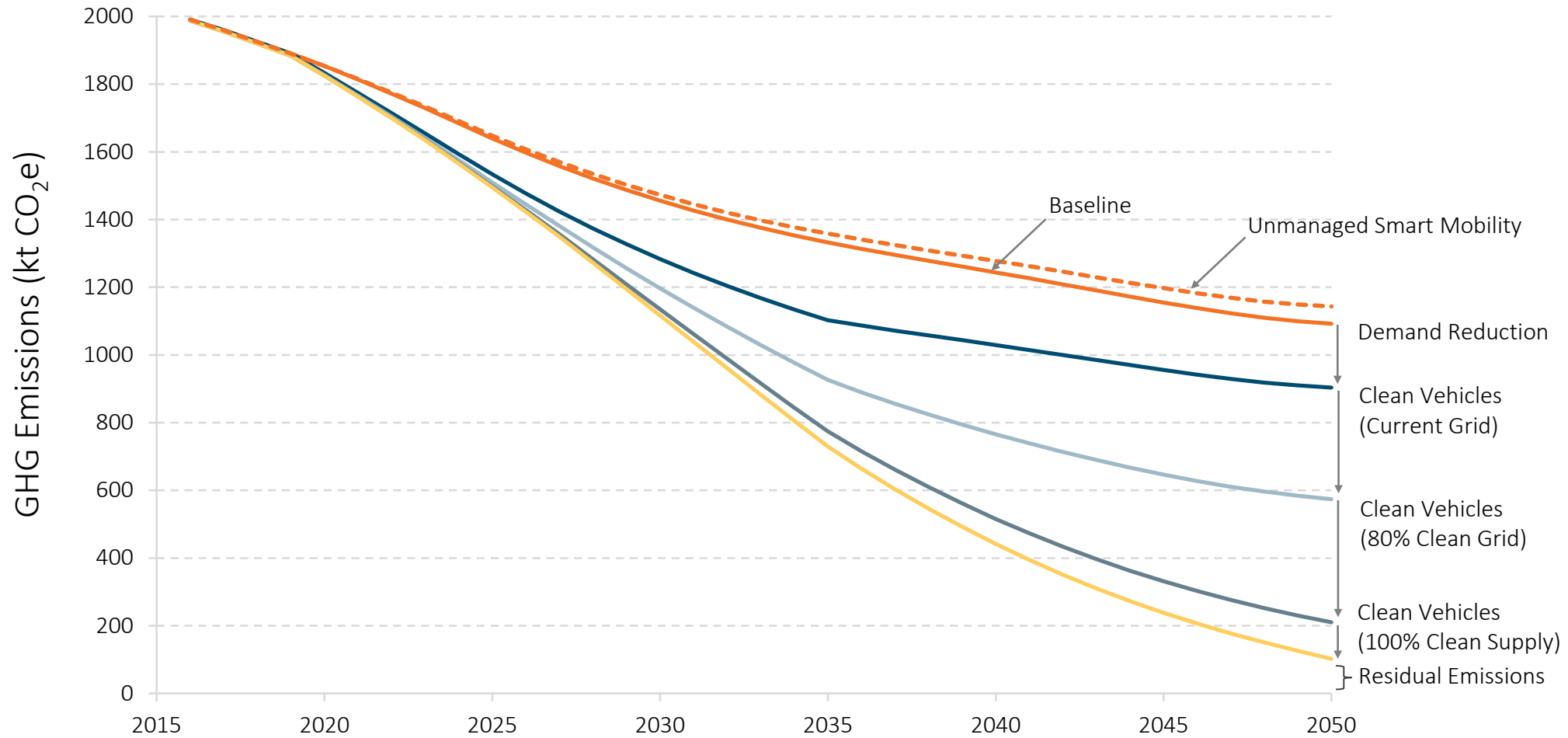
Whole system approach:

- Congestion & Parking Pricing
- VMT Fee (State Policy)
- Managed Ride Hailing
- Free and reduced cost transit
- Improved transit service



Mode	Baseline	Pathway to 2050 Scenario	Percentage change
Private Vehicles	2,010,145	853,748	-58%
Shared Mobility	79,899	884,065	+1006%
Transit	470,680	672,406	+43%
Walking + Biking	973,448	1,079,763	+11%
Total Person Trips	3,534,172	3,489,983	-1%
Cumulative VMT to/from Boston			-33%
Auto ownership in Boston			-45%
Auto ownership outside Boston			-30%

Path to Carbon-Neutral Transportation



Benefits of Carbon-Neutral Transportation

Benefits in 2050

\$ 259 million reduction in motor vehicle crash costs

29% to 55% reduction in harmful air pollutants

\$ 8 million health care savings from air quality improvements

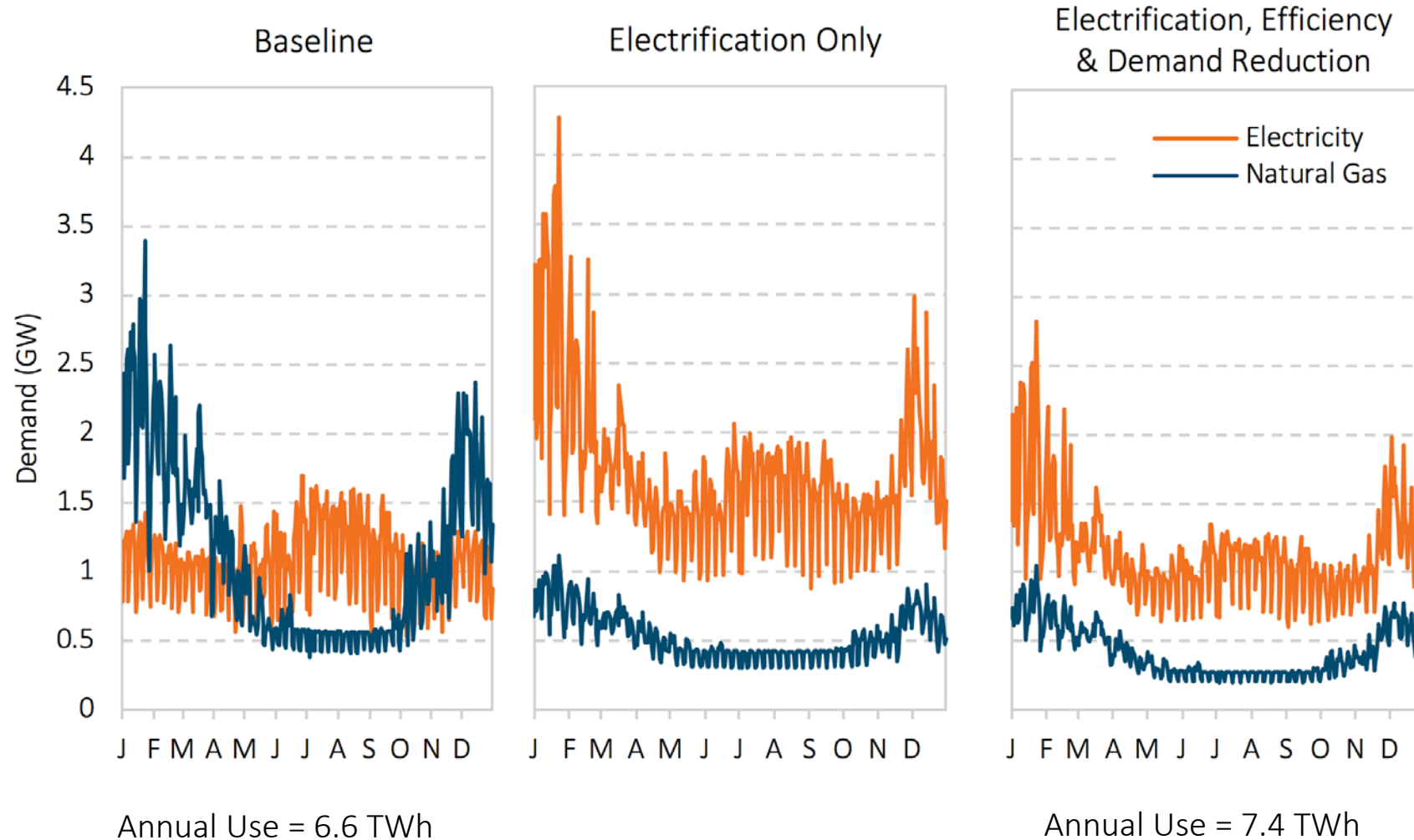
\$ 52 million in health care savings from increased physical activity

\$ 414 in vehicle operation cost savings



Energy Demand

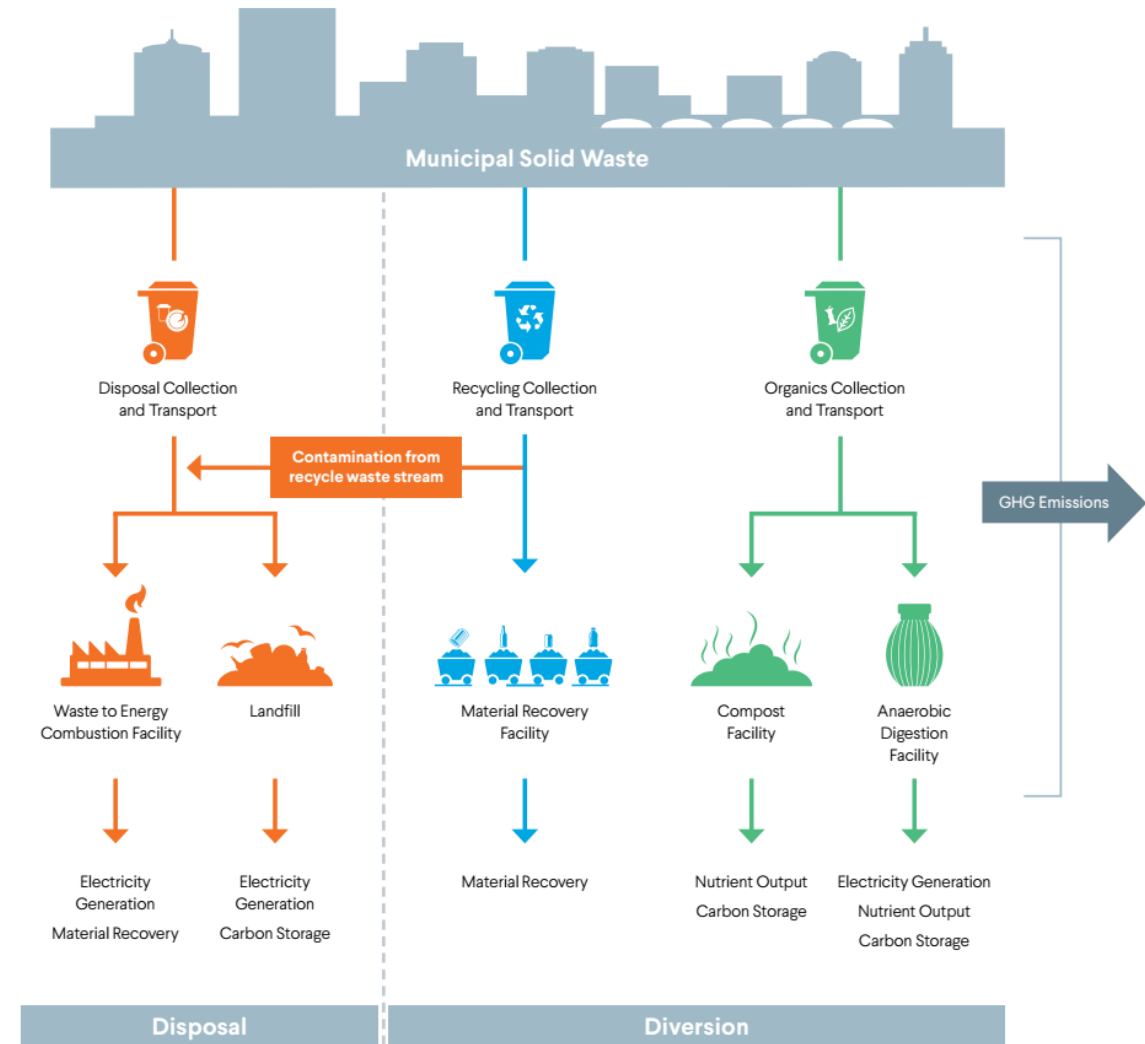
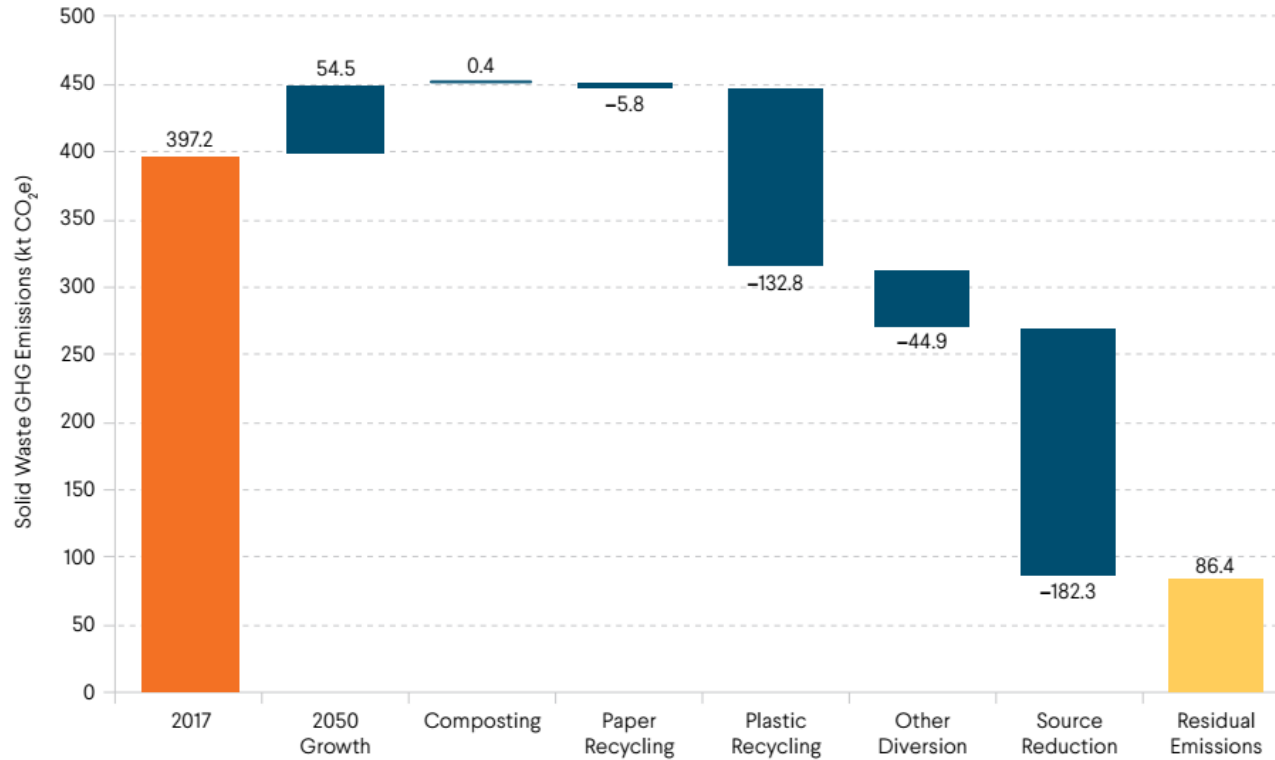
Efficiency and Electrification Reduce Demand and Change Load Profile





Waste

Zero Waste Boston



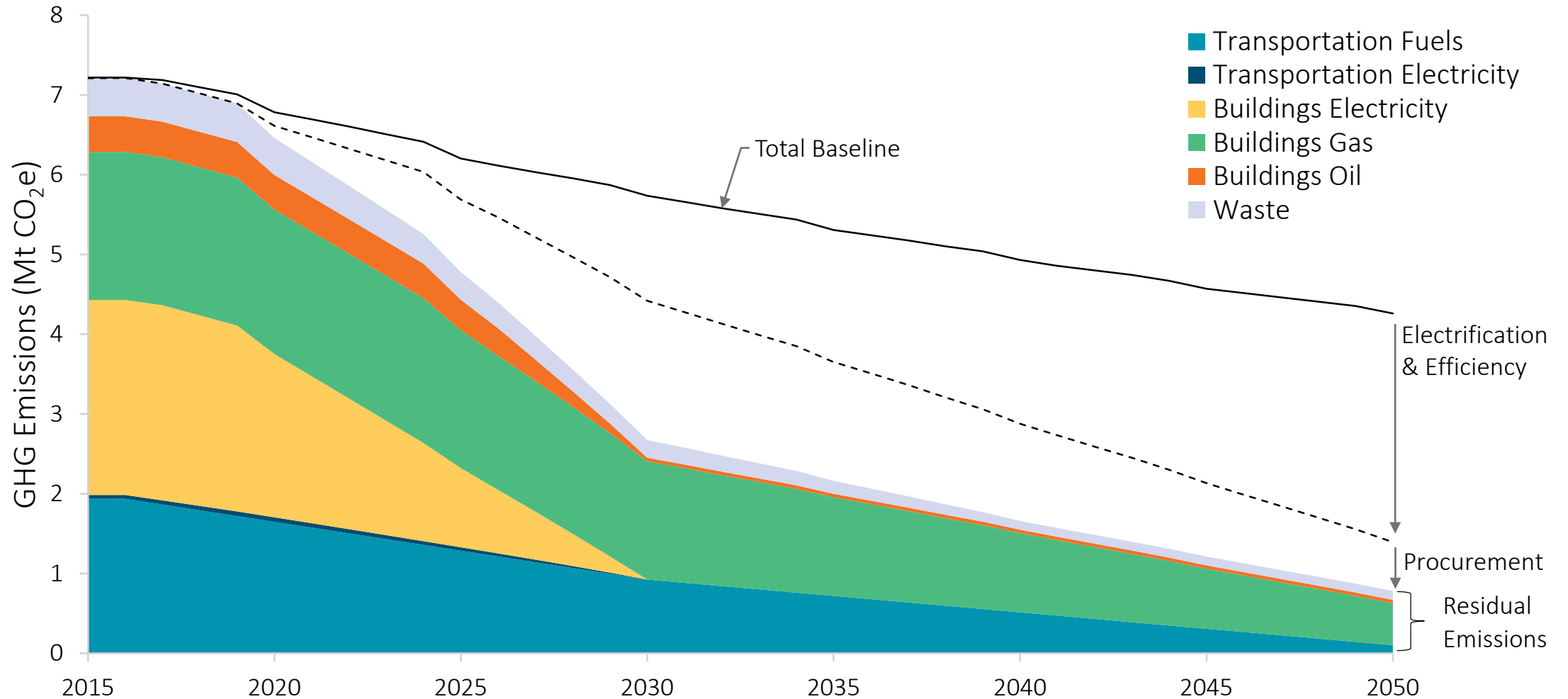


Clean Energy

City-wide Procurement of Clean Electricity Will Be Needed

Mechanisms	Technology Status	GHG Reduction	Economic Benefits	Cost Certainty	Regional Acceleration
In-City Generation	Available	~15% of City Demand	Positive	High	High
Renewable Energy Credit Aggregation	Available	All Emissions	Positive	Moderate	High
Local Power Purchase Agreement (e.g., Community Choice Aggregation)	Available	All Emissions	Positive	High	Moderate
Non-local (Virtual) Power Purchase Agreement	Available	All Emissions	Positive	High	None

The Path to Carbon-Neutrality



Three Mutually Reinforcing Strategies Must Be Pursued Together



Reduce demand for energy and deepen energy efficiency



Electrify all energy services to extent practicable



Purchase 100% clean electricity



DISCUSSION / Q+A

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THANK YOU

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Kathryn Carlson, Director of Transportation
Yve Torrie, Director of Sustainability Programs

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