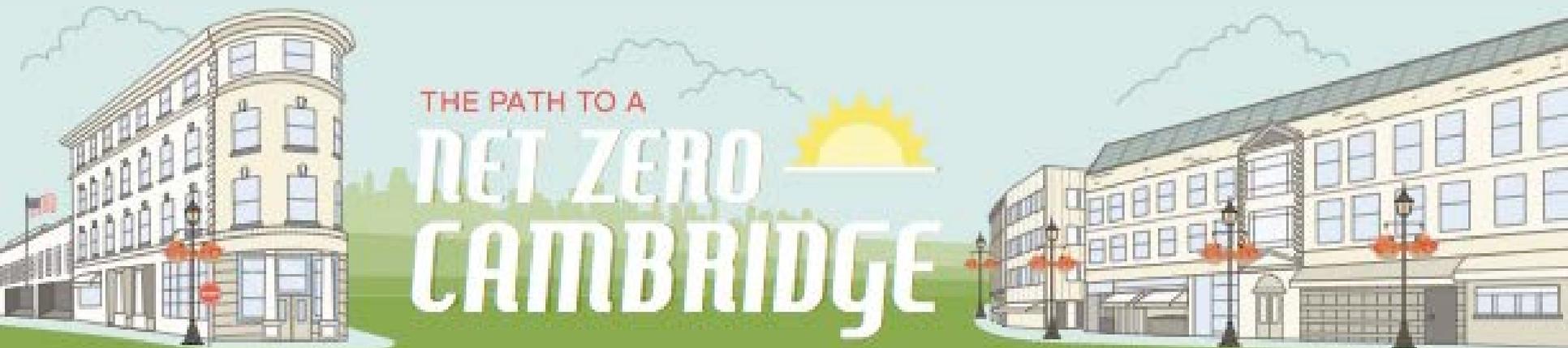


Net Zero Action Plan

Health & Environment Committee

June 9, 2015



1

THE CLIMATE IMPERATIVE

Climate change poses a growing set of risks and challenges to cities.

80%

Combating climate change needs to **start locally**

Buildings generate over 80% of Cambridge's total greenhouse gas emissions.

That is why it is Cambridge's aim to achieve

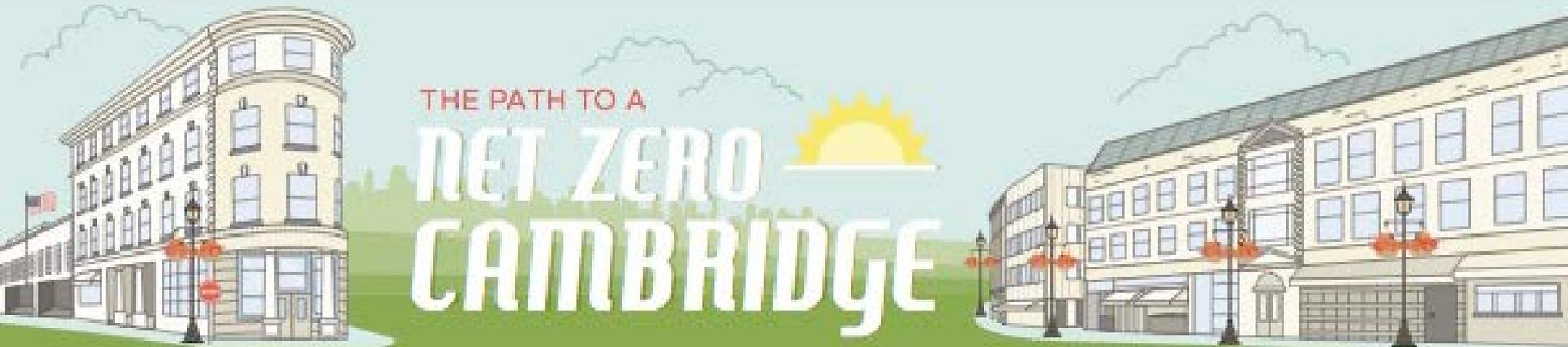
NET ZERO EMISSIONS

from buildings.

Residents, universities, businesses and the City are collaborating to address the immediacy of the climate imperative.

Agenda

1. Taskforce Process
2. Historic GHG's and Energy Use in Cambridge
3. Development of Strategies
4. Summary of the Net-Zero Action Plan
5. Implementation



NET ZERO TASK FORCE

Jane Carbone,

Director of Development, Homeowner's Rehab, Inc.

Caitriona Cooke,

Program Director, Conservation Services Group

Henrietta Davis,

Resident and former Mayor of Cambridge

Emily Grandstaff-Rice,

President (2014), Boston Society of Architects, Cambridge Seven Associates

Heather Henriksen,

Director of the Office for Sustainability, Harvard University

Shawn Hesse,

Architect, Sustainability Expert at Emersion Design

Marc Hoffman,

Resident and Energy Efficiency Advisor

Bill Kane,

Vice President of Leasing & Development, BioMed Realty

Andrea Love,

Resident, and Director of Building Science, Payette Architects

Paul Lyons,

Resident and President, Zapotec Energy, Inc.

Joseph Maguire,

V. P. of Development & Asset Management Services, Alexandria Real Estate Equities

Julie Newman,

Director of Sustainability, Massachusetts Institute of Technology

Tom Sieniewicz,

Resident and Planning Board member, City of Cambridge

Barun Singh,

Resident and Founder & CTO of Wegowise

Quinton Zondervan,

Resident and Executive Director, Climate Action Liaison Coalition



DEFINITION OF NET ZERO

The Task Force defines net zero with respect to the city as a whole as:

A community of buildings for which, on an annual basis, all greenhouse gas emissions produced through building operations are offset by carbon-free energy production. Achieving the net zero objective relies on a combination of energy efficiency improvements, renewable energy production and, where necessary, purchase of carbon offsets or, potentially, credits (that meet specific criteria).

The definition **does not** include:

- Embodied emissions generated from the manufacture of building materials
- Building construction activities
- Occupant transportation and waste



CITY COUNCIL

Requests of Council:

1. Endorse the recommended set of actions
2. Endorse the recommended process that engages stakeholders over time



EARLY ACTION ITEMS

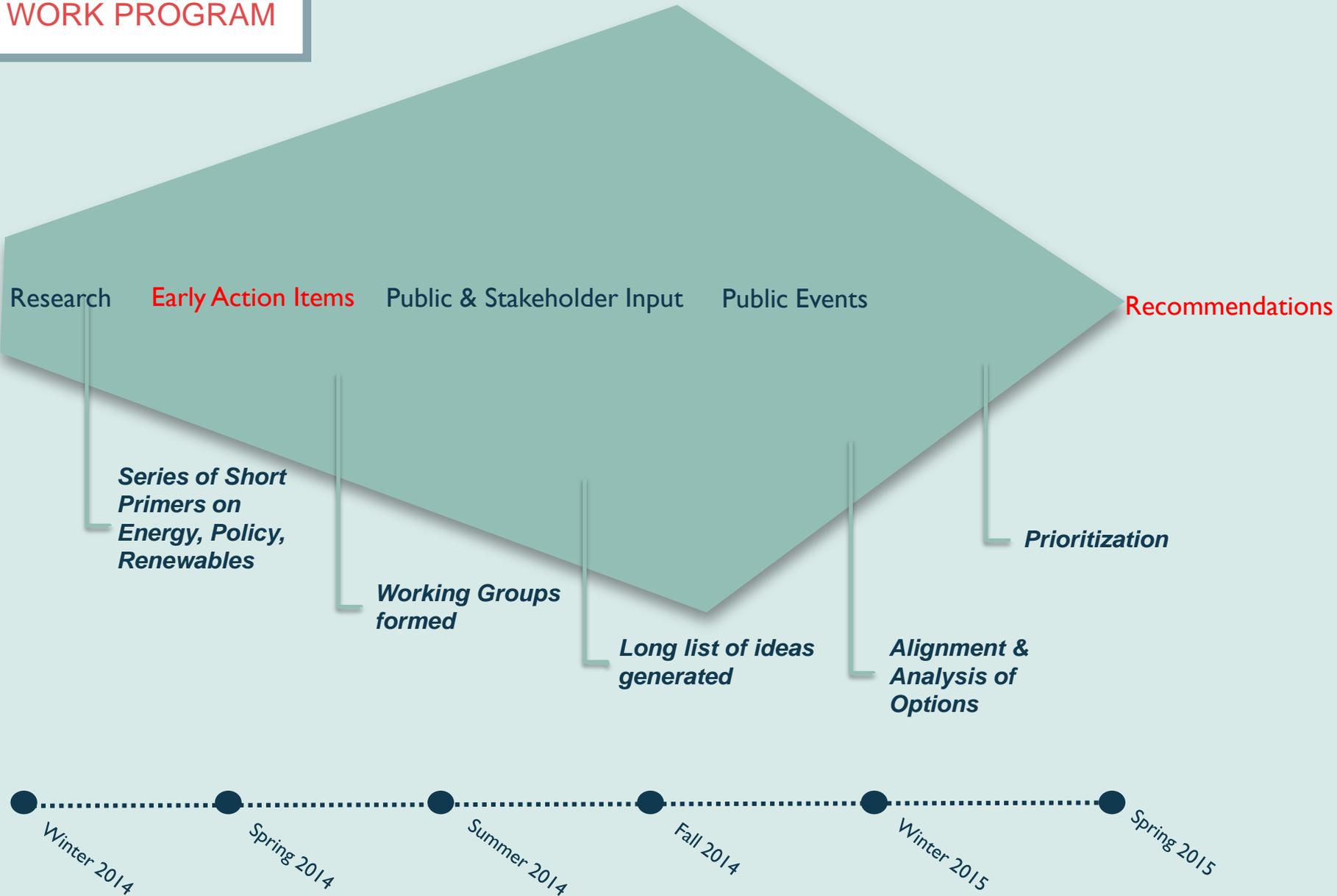
- Recommend update to the zoning ordinance for design of new buildings from LEED Silver to LEED Gold
- Advocate for an update to the State “stretch” building code which mandates better energy performance
- Adoption of a Building Energy Use Disclosure Ordinance



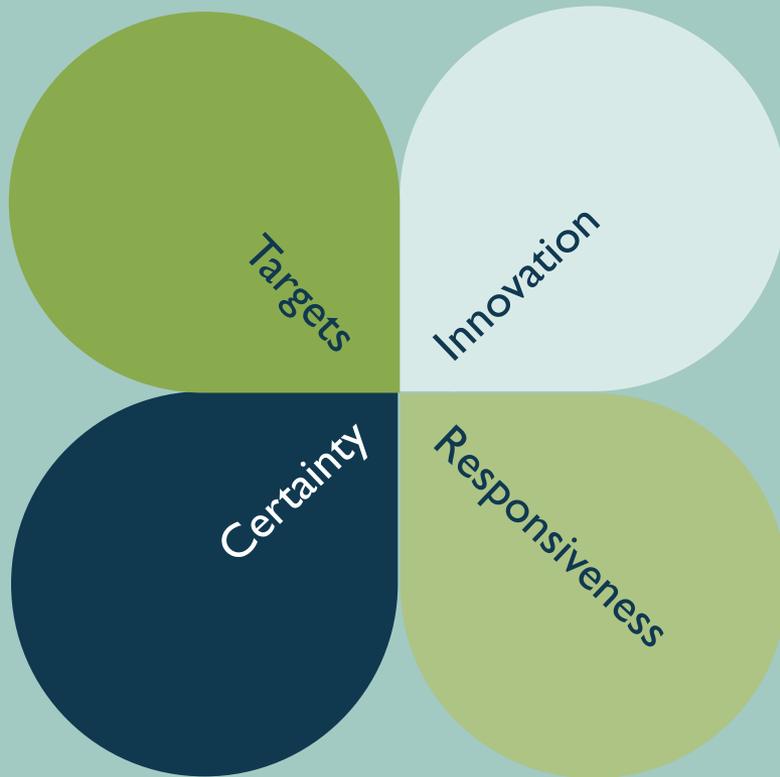
TASK FORCE OBJECTIVES

- Agreement on a methodology, strategy, targets, and timeline for achieving net zero emissions.
- Recommendations outlining short-term actions (1-3 years) and longer-term actions (4-10 years).
- Recommendations include direction on Regulation, Planning measures, Incentives, and Renewable Energy generation initiatives and Net-Zero Targets for new construction.
- Understanding the projected impacts of each action.
- Commitments of support or alignment from partners who are critical to the success of the plan.
- Agreement on an ongoing communication, reporting and accountability strategy.

**TASK FORCE
WORK PROGRAM**



THE FRAMEWORK



The Net Zero Framework is a balance of:

- Defined Targets
- A process to adapt and respond to changes in the market and technology
- Costing & feasibility assessment when appropriate
- Regulations & incentives
- New construction & existing buildings
- Equally targets savings from all sectors (no one sector is punished)

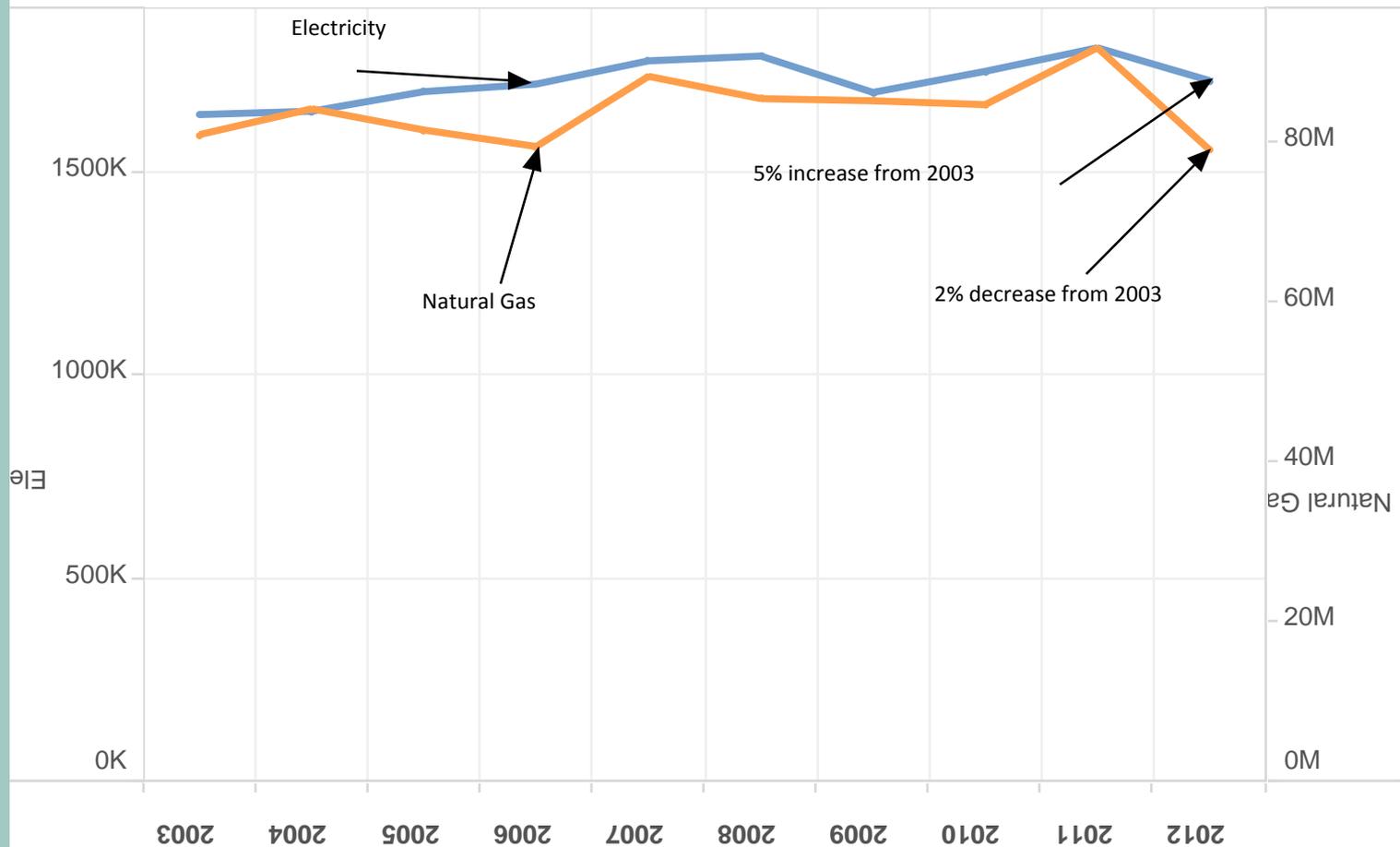


ENERGY USE IN CAMBRIDGE

Electricity and natural gas have been nearly flat over the last decade.

Year to year, use has varied due to variations in weather and economic activity.

Electricity and Gas Use

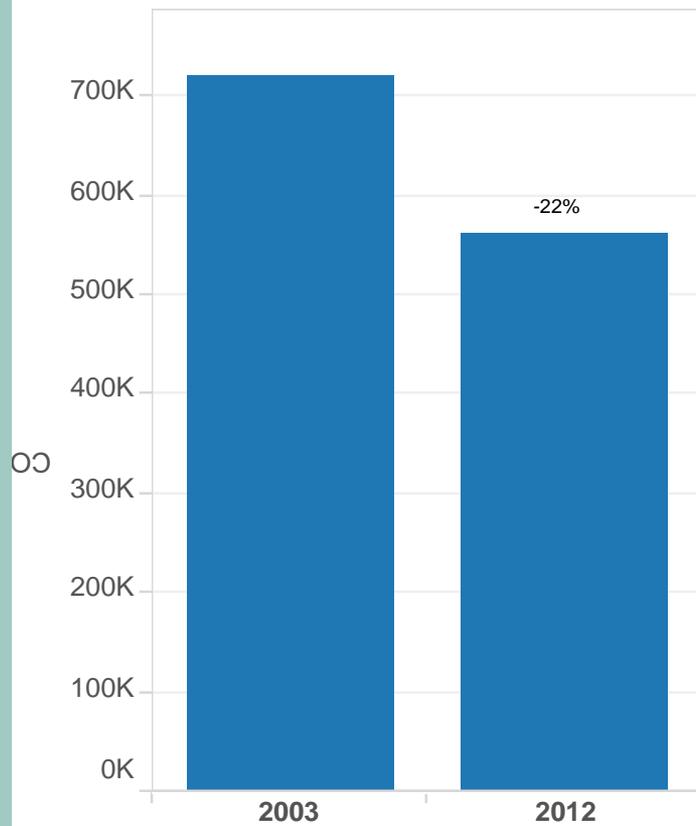


Source: NSTAR

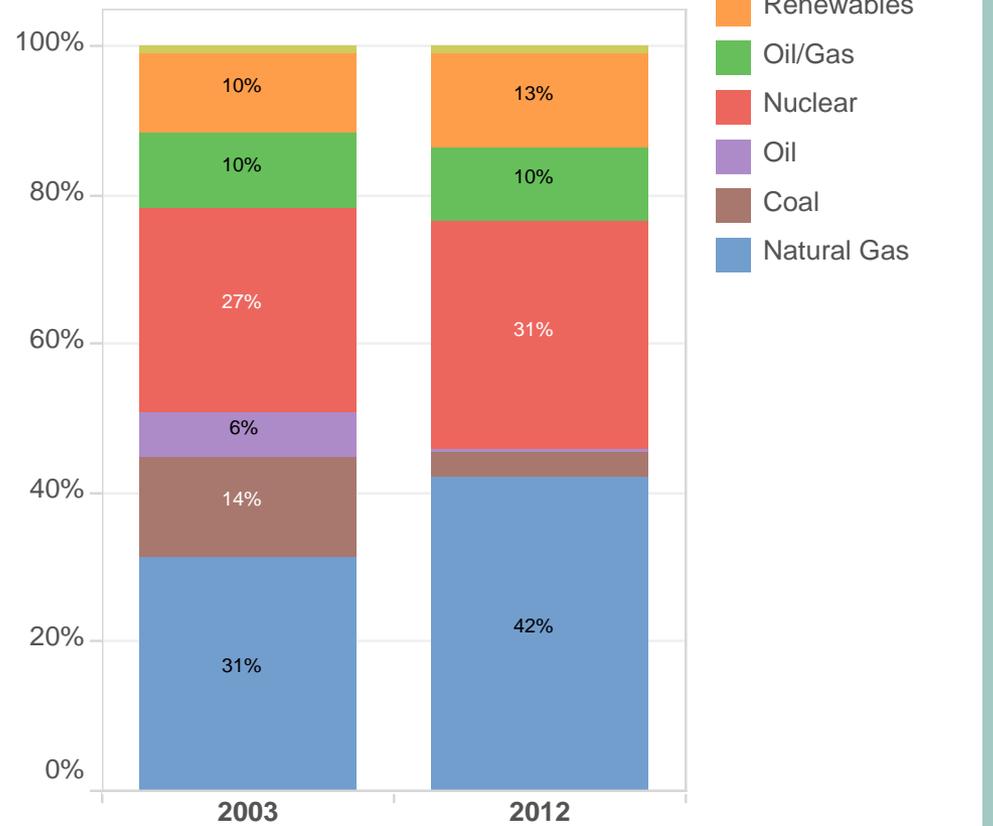
ENERGY USE IN CAMBRIDGE

Although electricity use has been flat, CO2 emissions have declined as generation has become cleaner.

Cambridge CO2 Emissions from Grid Electricity

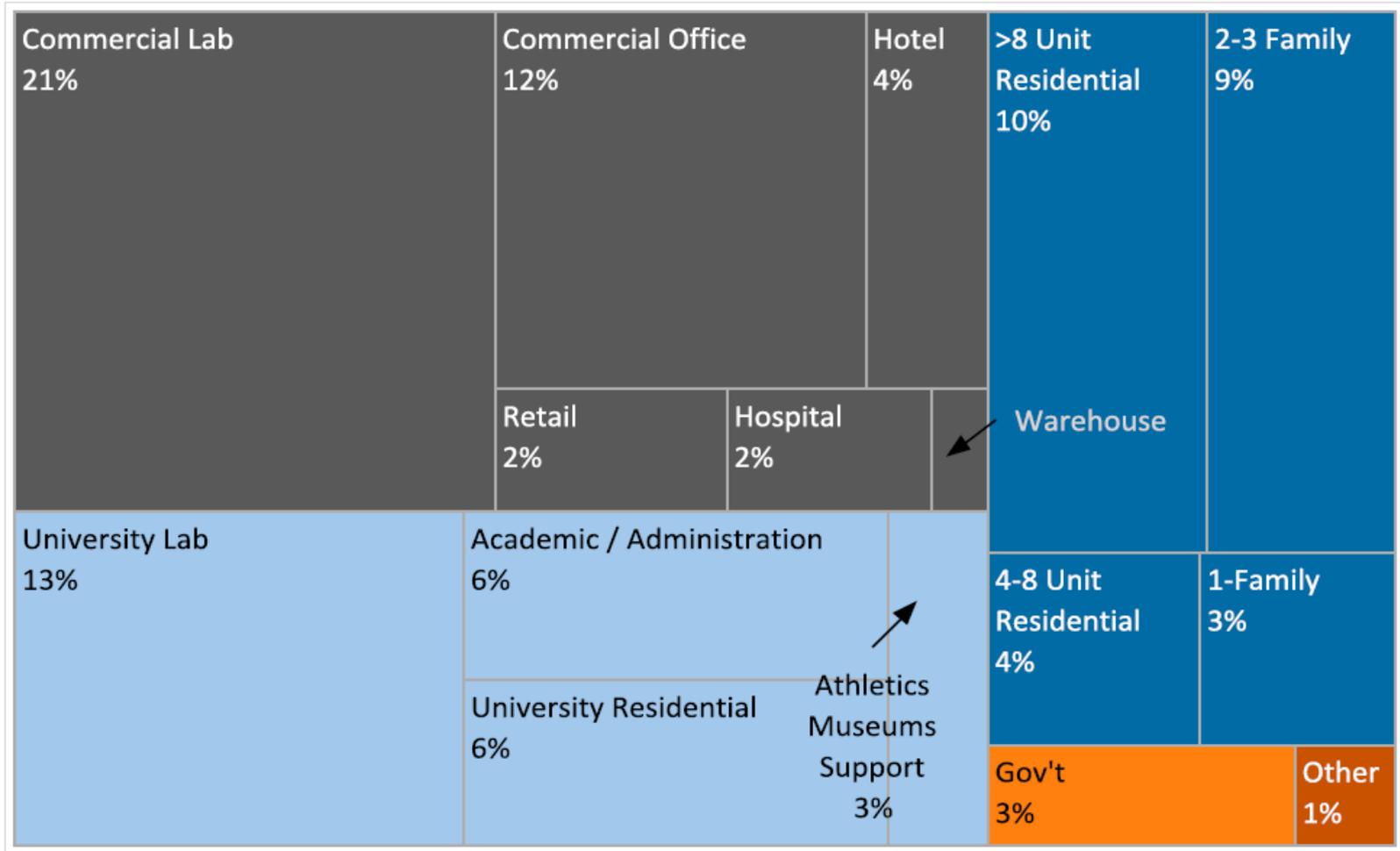


New England Electric Generation by Fuel Type



Sources: NSTAR and ISO-New England.

Estimated Energy Use by Space Type



POLICY BEST PRACTICES REVIEW

List of cities included in the report:

- Cambridge, MA
- Fort Collins, CO
- Austin, TX
- Boston, MA
- New York City, NY
- San Francisco, CA
- Vancouver, BC
- Seattle, WA



THE PATH TO A
NET ZERO
CAMBRIDGE



WHAT DETERMINES THE USE OF RENEWABLES?

- Access to renewable resources
 - Solar Conditions
 - Geological Conditions
 - Wind
- Age of building stock
- Load density and profile

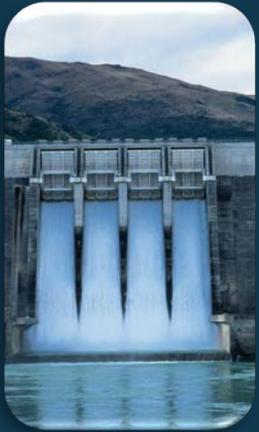


THE PATH TO A
NET ZERO
CAMBRIDGE



TECHNOLOGY

Hydro



Wind



Solar PV



Combustion



Heat-pumps
& Energy
Recovery



Solar
Thermal



Electricity

Heating/Cooling



THE PATH TO A
NET ZERO
CAMBRIDGE



REDUCTION

Retrofits

Replacement

Engagement

TARGET

RENEWABLES

Onsite

Solar & Geo Exchange

District Scale

CHP, Waste Heat Recovery, Heat-Pumps

Grid Scale

Wind Farms, Hydro



THE PATH TO A
NET ZERO
CAMBRIDGE



ESTABLISHMENT OF
WORKING GROUPS

Net Zero

(16 Members)

Regulations &
Planning
Approaches

Incentives and
Financing Tools

Energy Supply
and Offsets

Engagement &
Behaviour
Change

Total of
32 Members



THE PATH TO A
NET ZERO
CAMBRIDGE



LIST OF STRATEGIES

SUMMARY OF NET ZERO TASK FORCE WORKING GROUPS' LIST OF PROPOSED ACTIONS

Over-arching issues: These	
1	Create / adopt data platform to track progress over time The discussion is included in a prototype data platform to track progress over time Data gathering: data is only one capability (not sub-management)
2	Utility engagement Engage DPU etc. to expand existing and identify potentially one Explore municipal landfills to do
3	Capacity We need to understand energy demand, identify city staff and identify 3rd party and see Chicago DC
4	Regional Advocacy How can the DC date/represent
1	Regulations drive maximum engagement in energy efficiency and renewables across all sectors Develop a menu of options and to see how they are Lending audit Subsidize for Energy audits CA/Net-zero CA Require energy Reporting/see Construction Solar incentives Local energy Incentives New Building code Target known programs Energy and Energy and
2	Building owners develop and Programs (between specific changes)

2	Regulations create new areas dedicated for specific clean energy own Districts or zones can be defined that are conducive to renewables, storage, micro-grids, district energy Planning areas A Planning areas B Planning areas C Planning areas D
3	Regulatory tools address tenant controlled design & operations Tenant controlled retrofits, Farnham programs also add Adopt LEED C4 Cert of Occup. Or Specifically at Farnham Tenant controlled Margined tenant
4	Leverage funding sources to drive specific and clean energy Use existing/fund renewable (firms) Add new require Possibly create new in Urban City zones Property tax/waivers New MOU w utility
1	Incentives promote adoption Develop a way to be getting better (like ideas, can't receive a Free audits for it Subsidize material allow for utility use Subsidize or free commercial build
2	Energy efficiency is the primary focus of incentives and EE programs are fully engaged. HELOC model for utilities that don't the "target" people need to think about interest, Owners Point of sale take need an offer consumer driven Project (CA/Net-zero) Develop/expand upgrades and anc upgrades (Thank
2	Building owners develop and Programs (between specific changes)

1	provide their own programs to improve tenant / occupancy performance Energy/Free" leases - you get energy allowance contingent on compliance w "Call phone" approach budget, covered in rent Landowners (in lots of lessons learned and EE Offer finance incentives Financing Savings on Results in "white space" other landlords to do this
3	Joining and permitting incentives drive new types of development & superior performance non-financial incentives + renewables Permitting or zoning incentives to support identified/strategic solutions Innovative ideas like N previously possible - see a fact associated w permit Business Improvement
4	Carbon becomes tangible commodity Monetization of carbon carbon fee exploration structural programs an experts who have developed focus groups with those previously mentioned Create a new entity ("C and) dispose funds for could be modeled as the by a board embedded to housing - as determined Community actors (prop Care) - drives actions of others.
3	New MOU developed with utilities to target specific actions Develop MOU to address focused, multi-sectored in "over anchoring" new utility MOU focus
4	Recognition, Competition and awards (events) programs drive actions Recognition programs rewards and recognition landlords hold tenant Develop partnerships incorporate energy focus

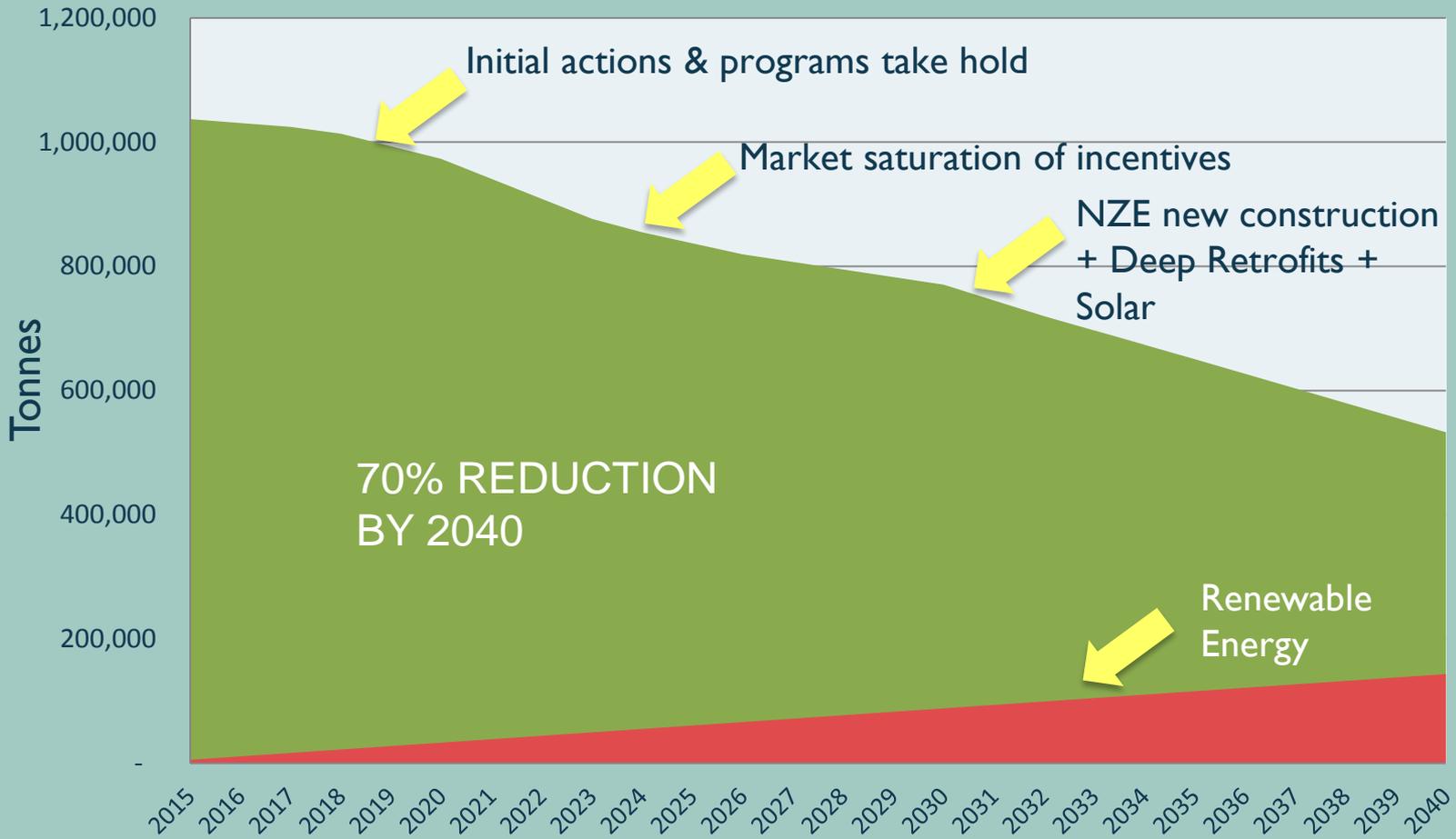
Energy Sources	
1	All available renewable resources are exploited to the fullest extent Develop granular under information about street property ownership/lease Identify solar resources Installations partner with interest. Feasible and under masterplan a forestry/land management Develop city-owned solar augmentation and other Solar thermal hot water Fuel switches where Anabolic digesters - to gas use - requires land to Offshore wind or hydro? completed for City owned electric energy systems
2	Adoptive storage facilities are developed to support maximum build out of renewables Energy storage storage financing generation apps for incentives and flag Identify partners (B&W) Identify opportunities to Consider longer term for entirely new storage port
1	Cambridge is a test bed for modern micro-grids and modernization Cambridge will be a test specific areas where this Smart metering & subse use metering (two way DMS and modernization Explore MOU with utility
1	Localized (solar) projects provide opportunities and options for all residents to participate. For those who don't meet community for city owned Community Solar - Next premium for green power "Cambridge carbon fund projects that are "local" city limits of Cambridge
3	Cambridge residents & professionals receive education from a comprehensive initiative Develop an education "round" partners (Mo leverage channels (like Info, Scout magazine Deliver exciting, new science field, everyone help)

1	Accelerate the adoption of new technologies to market Cambridge is a test bed for new technologies - solar roadways, energy storage, floating hydro, new fuels, BPP, other - coordinate w planned/scheduled things like road repair, etc (E see http://milton.vt.edu)
1	Delivered through partners Scavenger hunt model, use phone to track/learn about different projects, visiting projects and allowing to pre-registered info Develop support/intervention for professionals to know/see (IDAP bring deal assist prog. 2014) team met to 2020 (ing MOU per new model, bring training programs to Cambridge area professionals, 10/11 or 2 half day workshops on expectations when there are new regulations for owners and professionals) similar to what NYC did for green schools
1	Competitions, challenges and rewards drive residents to maximize EE and support renewable Develop competitions and challenges among affinity groups. Develop targeted challenges (partner with groups - either "sponsored" or others) Consider block by block competition, Lab to Lab, school to school, commercial multi-tenant bldgs. Creation of special districts (with particular value i.e., Lexington Ave. can provide a way to target group activities (a la "mission green district" which facilitates engagement of landlords.) Create "Zero Hero" - Cambridge celebrities.
1	Building owners and tenants participate in voluntary disclosure of energy use Encourage voluntary energy disclosure (consumer driven rather than in addition to regulation) - Monthly energy disclosure or by use - as tool especially on turnover (agreements)
1	Data made public through building disclosure ordinance is leveraged to encourage improvement Publicize energy use of public buildings in Cambridge (transparency) (using by example will encourage others to follow suit. There is a feedback loop and people can see the impact of their actions (individually, collectively)

1	Perceive communications campaigns with messaging Signage, messaging and media. It is impossible New PR firm to develop messaging about topics One is "good" and become One brand ("Cambridge partnerships etc.) (most unacceptable to be an owner) Powerful video campaign this old ad: https://www.facebook.com/energyaction , media, influencers, etc. Community Visibility MFA, communities of (competition for campus stations (local structure public energy/information Innovation Day (for an functioning operational building, universities a
2	Targeted outreach focus incentives and any new Targeted outreach focus incentives and any new Energy concierge "tools how to maximize out supplementary work (in dedicate utility staff to targeted outreach like Promote new (w lean model - include EE the lower your tax is Targeted green lease Identify new staff CAE) Promote equipment
1	Cambridge residents & professionals receive education from a comprehensive initiative Develop an education "round" partners (Mo leverage channels (like Info, Scout magazine Deliver exciting, new science field, everyone help)



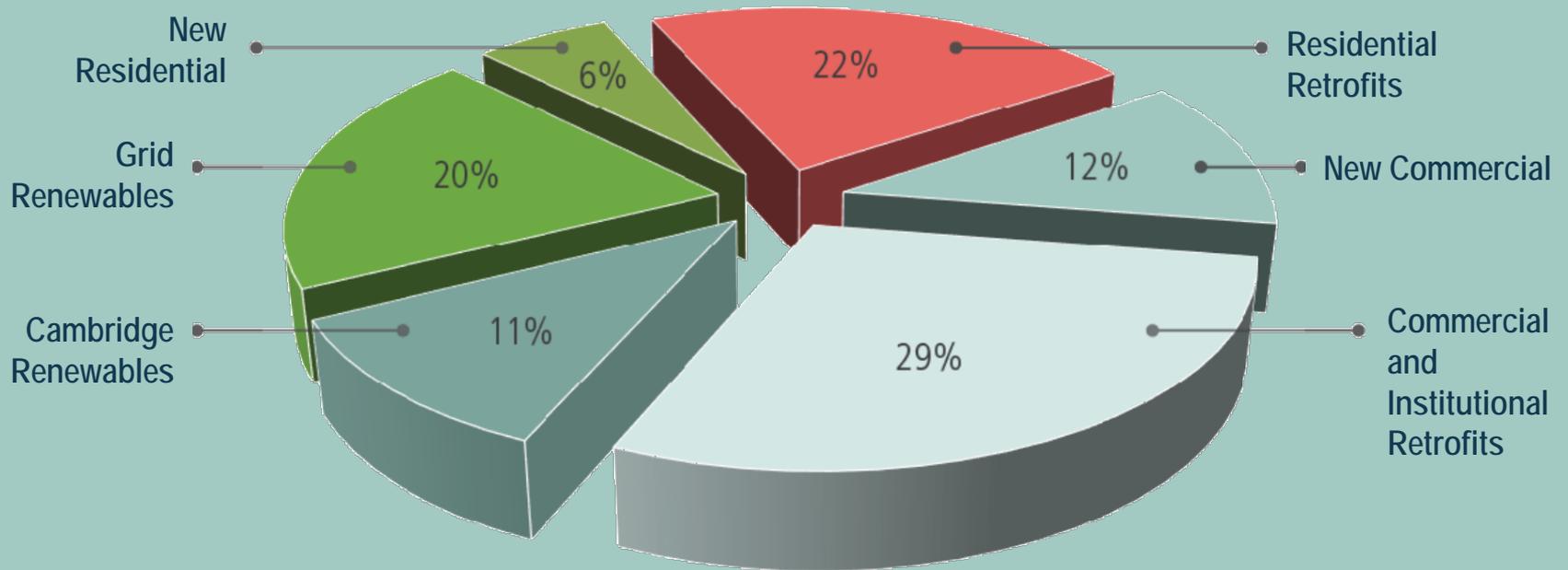
CAMBRIDGE EMISSIONS REDUCTION MODEL



CAMBRIDGE EMISSIONS REDUCTION MODEL

Key Actions:

1. Retrofits to Existing Buildings
2. Net Zero New Construction
3. Energy Supply
4. Local Carbon Fund
5. Engagement & Capacity Building



5

ACTION PLAN



Energy Efficiency in Existing Buildings

Reduce energy use in buildings through retrofits and improved operations.

Net Zero New Construction

Require low carbon new construction.

Local Carbon Fund

Option to invest in a net zero community.

Renewable Energy Supply

Replace fossil fuels with low carbon energy.

Engagement and Capacity Building

Industry training and community involvement.



THE PATH TO A
NET ZERO
CAMBRIDGE



DETAILED ACTION PLAN

I. Energy Efficiency in Existing Buildings

I.1.1 Custom Retrofit Program

Retrofit program built on performance outcomes

I.1.2 Additional BEUDO Requirements

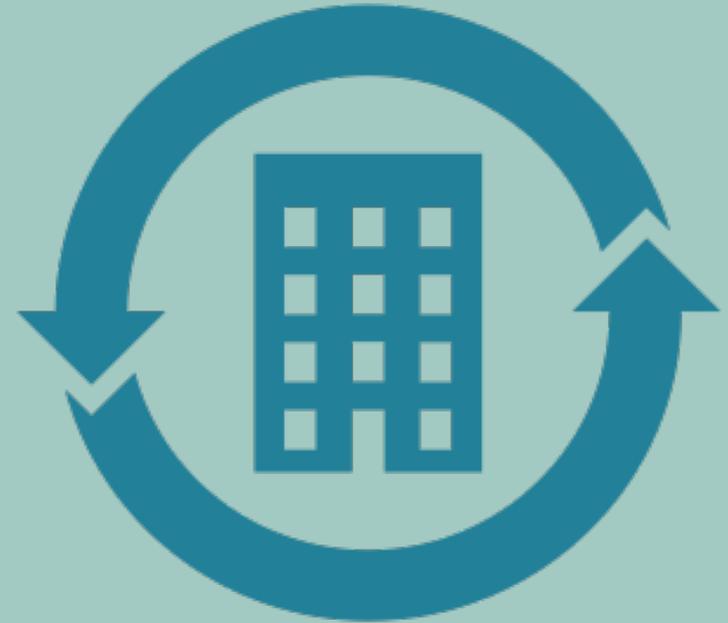
Add audit and retro-commissioning requirements

I.1.3 Upgrades at Time of Renovation or Sale

Explore minimum upgrades at various trigger points

I.1.4 Operations and Maintenance Plan Requirement for New Construction

Replicate success of TDM plans for building energy use.



DETAILED ACTION PLAN

2. Net Zero New Construction

2.1 Create Net Zero Targets for New Construction

(See below)

2.2 Net Zero Incentives

Develop market based incentive program

2.2.2 Height + FAR Bonus

Explore height & FAR bonus as part of Citywide Plan



Type:	Municipal	Residential	Multi-Family	Commercial	Institutional	Labs
Target year:	2020	2022	2025	2025	2025	2030

DETAILED ACTION PLAN

2. Net Zero New Construction (Continued)

2.3 Increase Green Building Requirements in the Cambridge Zoning Ordinance

2.4 Net Zero Requirement for New Construction + Deep Retrofits of Municipal Buildings

2.4.1 Net Zero Requirement for New Construction
(Previous Slide)

2.4.2 Deep Retrofits of Municipal Buildings

2.5 Removal of Barriers to Increased Insulation



DETAILED ACTION PLAN

3. Energy Supply

3.1 Low Carbon Energy Supply Strategy

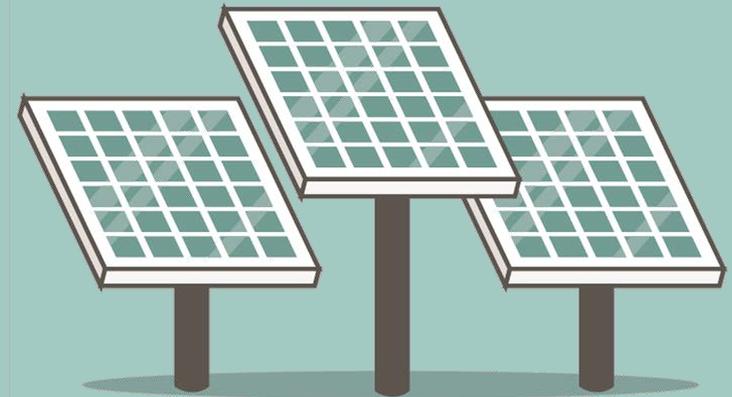
Develop a city wide energy supply strategy

3.2 Rooftop Solar Ready Requirement

Make new construction “solar ready” moving to a renewable energy requirement

3.3 Develop a Memorandum of Understanding with Local Utilities

Create a framework for collaboration on Net Zero actions



DETAILED ACTION PLAN

4. Local Carbon Fund

Investigate Local Carbon Fund

Allow for investment in the Net Zero Action Plan



DETAILED ACTION PLAN

5. Engagement & Capacity Building

5.1 Communication Strategy

Build awareness, partnerships and educate stakeholders

5.2 Develop Ongoing Capacity to Manage Getting to Net Zero Project

Assign staff & consulting resources

5.3 Net Zero Lab Standards and Maintenance Plan Requirement for New Construction

Work with industry to develop new processes that support net zero



CAMBRIDGE NET ZERO ACTION PLAN

Net Zero + Net Positive Targets

YEAR	July 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
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Action 1 - Energy Efficiency in Existing Buildings

Action 2 - Net Zero New Construction

Action 3 - Energy Supply

Action 4 - Local Carbon Fund

Action 5 - Engagement and Capacity Building



PROGRAM WIDE REVIEW – EVERY 5 YEARS

Stakeholder-Based
Program Wide Review

Net Zero + Net Positive Targets																					
YEAR	July 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Action 1 - Energy Efficiency in Existing Buildings																					
Action 2 - Net Zero New Construction																					
Action 3 - Energy Supply																					
Action 4 - Local Carbon Fund																					
Action 5 - Engagement and Capacity Building																					



NET ZERO + NET POSITIVE TARGETS

Net Zero/Positive Target

Stakeholder-Based Program Wide Review

Net Zero + Net Positive Targets					Net Zero Municipal					Net Zero Residential 1-3 Units					Net Zero Commercial Multi-Family Institutional					Net Zero Labs					Net + Municipal				
YEAR	July 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035								
Action 1 - Energy Efficiency in Existing Buildings																													
Action 2 - Net Zero New Construction																													
Action 3 - Energy Supply																													
Action 4 - Local Carbon Fund																													
Action 5 - Engagement and Capacity Building																													



SPECIFIC ACTIONS



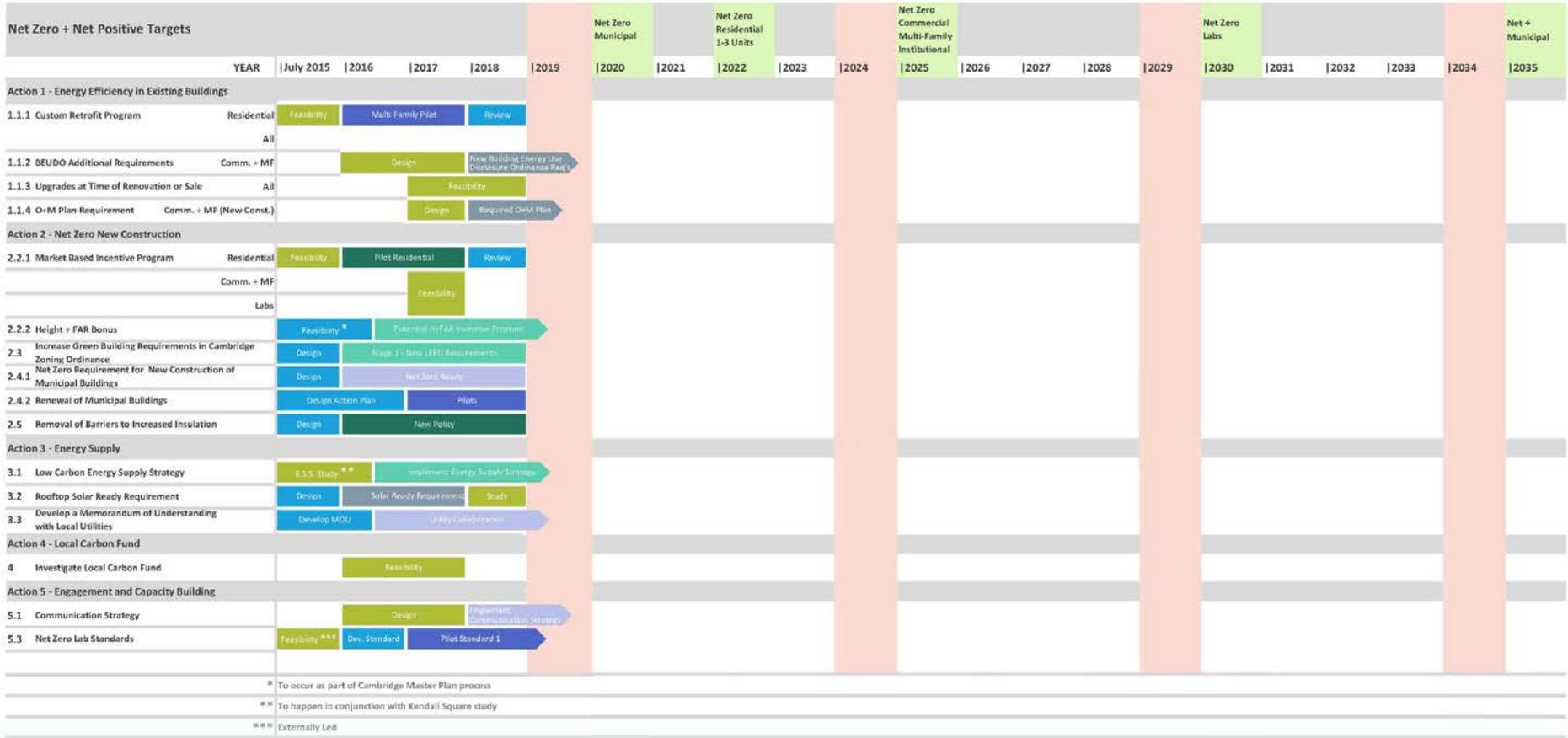
Net Zero + Net Positive Targets					Net Zero Municipal					Net Zero Residential 1-3 Units					Net Zero Commercial Multi-Family Institutional					Net Zero Labs					Net + Municipal				
YEAR	July 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035								
Action 1 - Energy Efficiency in Existing Buildings																													
1.1.1 Custom Retrofit Program																													
1.1.2 BEUDO Additional Requirements																													
1.1.3 Upgrades at Time of Renovation or Sale																													
1.1.4 O+M Plan Requirement																													
Action 2 - Net Zero New Construction																													
2.2.1 Market Based Incentive Program																													
2.2.2 Height + FAR Bonus																													
2.3 Increase Green Building Requirements in Cambridge Zoning Ordinance																													
2.4.1 Net Zero Requirement for New Construction of Municipal Buildings																													
2.4.2 Renewal of Municipal Buildings																													
2.5 Removal of Barriers to Increased Insulation																													
Action 3 - Energy Supply																													
3.1 Low Carbon Energy Supply Strategy																													
3.2 Rooftop Solar Ready Requirement																													
3.3 Develop a Memorandum of Understanding with Local Utilities																													
Action 4 - Local Carbon Fund																													
4 Investigate Local Carbon Fund																													
Action 5 - Engagement and Capacity Building																													
5.1 Communication Strategy																													
5.3 Net Zero Lab Standards																													



THE PATH TO A
NET ZERO
CAMBRIDGE



SHORT TERM ACTIONS



* To occur as part of Cambridge Master Plan process

** To happen in conjunction with Kendall Square study

*** Externally Led



THE PATH TO A
**NET ZERO
CAMBRIDGE**



MEDIUM TERM ACTIONS



Net Zero + Net Positive Targets		YEAR																					
		July 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Action 1 - Energy Efficiency in Existing Buildings																							
1.1.1 Custom Retrofit Program	Residential	Feasibility	Multi-Family Pilot	Review	Potential Multi-Family Program							Review											
	All				Feasibility	Custom Retrofit Pilot	Review	Custom Retrofit Program															
1.1.2 BEUDO Additional Requirements	Comm. + MF		Design	New Building Energy Use Disclosure Ordinance Req's							Review	Version 2 Potential T.C.S./B. Requirements											
1.1.3 Upgrades at Time of Renovation or Sale	All			Feasibility	Potential T.C.S./B. Requirements							Review											
1.1.4 O+M Plan Requirement	Comm. + MF (New Const.)		Design	Required O+M Plan							Review	Required O+M Plan											
Action 2 - Net Zero New Construction																							
2.2.1 Market Based Incentive Program	Residential	Feasibility	Pilot Residential	Review	Pot. Net Incentive Program				Review	Potential Net-Zero Incentive Program													
	Comm. + MF				Feasibility	Pilot Commercial	Review	Potential Net-Zero Incentive Program															
	Labs					Pilot Labs	Review	Potential Net-Zero Incentive Program															
2.2.2 Height + FAR Bonus		Feasibility*	Potential Net-Zero Incentive Program							Review	Potential Net-Zero Incentive Program												
2.3 Increase Green Building Requirements in Cambridge Zoning Ordinance		Design	Stage 1 - New LEED Requirements				Review	Stage 1 - New LEED Requirements				Review											
2.4.1 Net Zero Requirement for New Construction of Municipal Buildings		Design	Net Zero Ready				Review	Net Zero Required				Review											
2.4.2 Renewal of Municipal Buildings		Design Action Plan	Pilots			Stage 1 - Building Renovation Strategy																	
2.5 Removal of Barriers to Increased Insulation		Design	New Policy			Review																	
Action 3 - Energy Supply																							
3.1 Low Carbon Energy Supply Strategy		ESS Study**	Implement Energy Supply Strategy																				
3.2 Rooftop Solar Ready Requirement		Design	Solar Ready Requirement	Study	Potential Solar Requirement Version 1																		
3.3 Develop a Memorandum of Understanding with Local Utilities		Develop MOU	Utility Collaboration							Review	Potential 2nd Utility Collaboration												
Action 4 - Local Carbon Fund																							
4 Investigate Local Carbon Fund			Feasibility	Establish Potential CO2 Fund																			
Action 5 - Engagement and Capacity Building																							
5.1 Communication Strategy			Design	Implement Communication Strategy																			
5.3 Net Zero Lab Standards		Feasibility***	Dev. Standard	Pilot Standard 1	Implement Potential Standard							Review											

* To occur as part of Cambridge Master Plan process
 ** To happen in conjunction with Kendall Square study
 *** Externally Led



LONG TERM ACTIONS



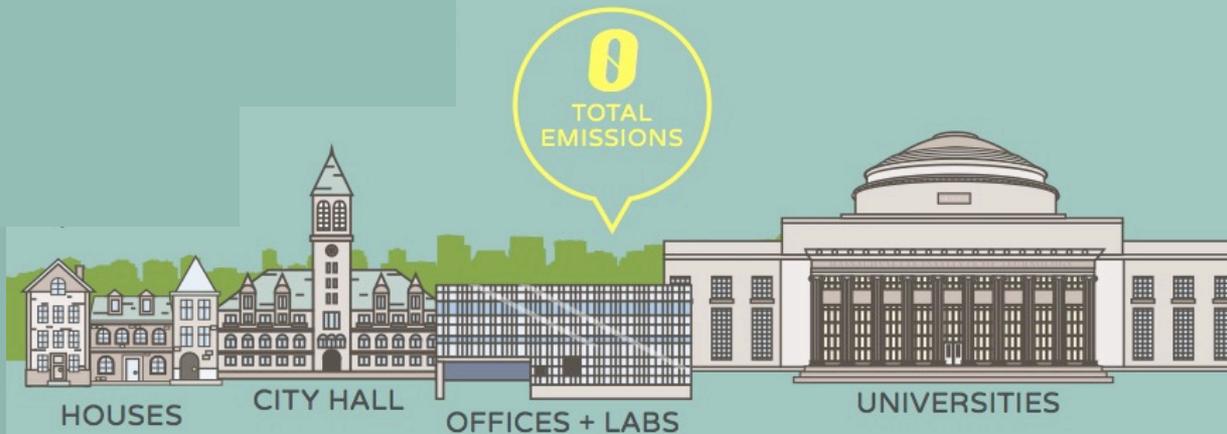
Net Zero + Net Positive Targets																						
YEAR (fiscal year July - June)		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Action 1 - Energy Efficiency in Existing Buildings																						
1.1.1 Custom Retrofit Program	Residential	Feasibility	Multi-Family Pilot	Review	Potential Multi-Family Program					Review	Potential Multi-Family Program											
	All				Feasibility	Custom Retrofit Pilot	Review	Current Retrofits Program					Review	Current Retrofits Program								
1.1.2 Additional BEUDO Requirements	Comm. + MF		Design	New Building Energy Use Disclosure Ordinance Req's					Review	Version 2 Potential T.O.S/R. Requirements					Review	Version 2 Potential T.O.S/R. Requirements						
1.1.3 Upgrades at Time of Renovation or Sale	All			Feasibility	Potential T.O.S/R. Requirements					Review						Review	Potential T.O.S/R. Requirements					
1.1.4 O+M Plan Requirement	Comm. + MF (New Const.)		Design	Required O+M Plan					Review	Required O+M Plan					Review	Required O+M Plan						
Action 2 - Net Zero New Construction																						
2.2.1 Market Based Incentive Program	Residential	Feasibility	Pilot Residential	Review	Pot. Net0 Incentive Program		Review	Potential Net+ Incentive Program			Review	Potential Net+ Incentive Program			Review	Potential Net+ Incentive Program						
	Comm. + MF				Pilot Commercial		Review	Potential Net0 Incentive Program			Review	Potential Net+ Incentive Program			Review	Potential Net+ Incentive Program						
	Labs		Feasibility		Pilot Labs		Review	Potential Net0 Incentive Program			Review	Potential Net0 Incentive Program			Review	Potential Net+ Incentive Program						
2.2.2 Height + FAR Bonus		Feasibility*	Potential H+Far Incentive Program					Review	Potential H+Far Incentive Program			Review	Potential H+Far Incentive Program			Review	Potential H+Far Incentive Program					
2.3 Increase Green Building Requirements in Cambridge Zoning Ordinance		Design	Stage 1 - New LEED Requirements			Review	Stage 3 - New LEED Requirements			Review	Stage 3 - New LEED Requirements			Review	Stage 4 - Potential New Green Building Requirements							
2.4.1 Net Zero Requirement for New Construction of Municipal Buildings		Design	Net Zero Ready			Review	Net Zero Required			Review	Net Positive Required			Review	Net Positive Required							
2.4.2 Renewal of Municipal Buildings		Design Action Plan	Pilots		Stage 1 - Building Renewal Strategy					Stage 2 - Building Renewal Strategy												
2.5 Removal of Barriers to Increased Insulation		Design	New Policy		Review	New Policy																
Action 3 - Energy Supply																						
3.1 Low Carbon Energy Supply Strategy		E.S.S. Study**	Implement Energy Supply Strategy																			
3.2 Rooftop Solar Ready Requirement		Design	Solar Ready Requirements		Study	Potential Solar Requirement Version 1					Potential Solar Requirement Version 2											
3.3 Develop a Memorandum of Understanding with Local Utilities		Develop MOU	Utility Collaboration					Review	Potential 2nd Utility Collaboration													
Action 4 - Local Carbon Fund																						
4 Investigate Local Carbon Fund			Feasibility	Establish Potential CO2 Fund																		
Action 5 - Engagement and Capacity Building																						
5.1 Communication Strategy		Design	Implement Communication Strategy																			
5.3 Net Zero Lab Standards		Feasibility***	Dev. Standard	Pilot Standard 1			Implement Potential Standard			Review	Pilot Standard 2			Implement Potential Standard								
* To occur as part of Cambridge Master Plan process																						
** To happen in conjunction with Kendall Square study																						
*** Externally Led																						



PUBLIC PROCESS & STAKEHOLDER ENGAGEMENT ITEMS

Engagement activities :

- All working group and Task Force meetings were open to the public
- A mid-year report was published
- A public forum featuring an external panel of net zero experts and offering the audience an opportunity to review and discuss preliminary Task Force recommendations.
- Consultation process with key stakeholders
- A final Public Forum where the Task Force presented the 25 year action plan and recommendations to solicit public input.



SUPPORT FROM STAKEHOLDERS

Key Stakeholder meetings:

- Massachusetts Biotech Council
- Cambridge Sustainability Compact
- Climate Protection Action Committee
- Cambridge Chamber of Commerce
- Cambridge Historical Commission Staff
- Cambridge Department of Public Works
- Harvard and MIT



Massachusetts
Institute of
Technology



FISCAL YEAR 2016 ACTIONS

- Update Green Building Requirements (LEED)
- Develop Rooftop Solar Ready Requirement
- Removal of Barriers to Increased Insulation
- Develop a City-wide Low Carbon Energy Supply Strategy
- Establish Net Zero Labs Working Group
- Collaboration on research for Market-Based Incentives
- Begin Municipal Building renewal strategy
- Continue developing a MOU with Local Utilities
- Develop Communication Strategy
- Staff and Consultant Budget Approved



NOTES FROM MEETING No. 1

- Be ambitious - channel the community ambition
- Balance environmental & economic concerns
- Equality in responsibility across all sectors
- Start with a vision & work backwards
- Establish a clear mission, vision, and deliverables
- Identify early action items
- Attempt to figure out how to get there, not can we get there



THANK YOU
QUESTIONS?



APPENDICES



1. ENERGY EFFICIENCY IN EXISTING BUILDINGS

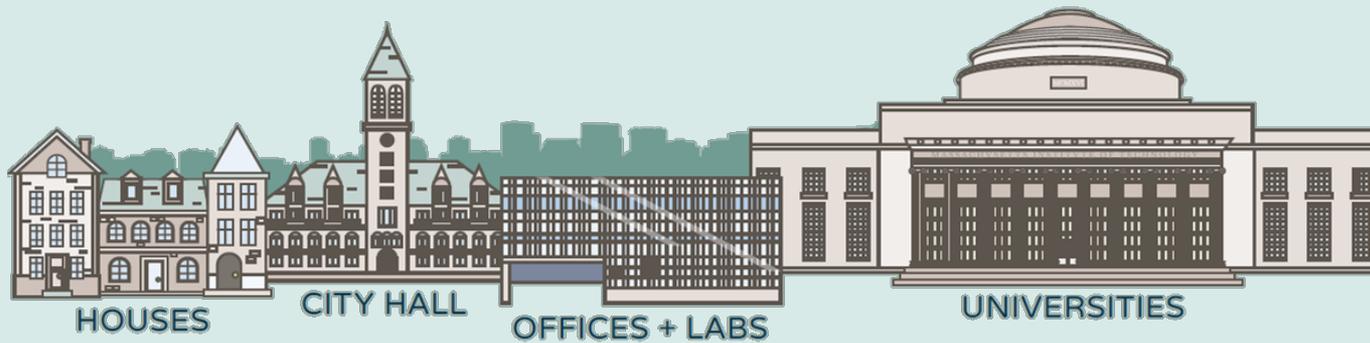
Reduce energy use in buildings through retrofits and improved operations.



1. ENERGY EFFICIENCY IN EXISTING BUILDINGS

1.1.1 CUSTOM RETROFIT PROGRAM

Explore *and develop* new retrofit programs



- Work with utilities to adapt current incentive programs to take a performance based approach where incentive amount is determined by relative GHG reductions associated with a given retrofit project (e.g. \$/ton)
- City staff currently in discussion with Eversource regarding a pilot retrofit program to MURB's that could serve as a pilot for this performance-based approach.



1. ENERGY EFFICIENCY IN EXISTING BUILDINGS

1.1.2 ADDITIONAL BEUDO REQUIREMENTS

Require owners of buildings covered under Building Energy Use Disclosure Ordinance to submit energy management plans and to undertake retro-commissioning where appropriate.

- Require energy audits and retro-commissioning every five years for buildings that perform below a predetermined threshold.
- Building owners will have a better understanding of their building's performance, supporting a shift toward more efficient, higher performing buildings.
- Require buildings that score below a certain percentile performance rating (i.e. as calculated by Portfolio Manager) to submit an Operations + Maintenance Plan up to every five years
- The Operations + Maintenance plans would be similar to retro-commissioning plans, identifying opportunities to optimize building operations and shift to renewable / low-carbon fuel sources



1. ENERGY EFFICIENCY IN EXISTING BUILDINGS

1.1.3 UPGRADES AT TIME OF RENOVATION OR SALE

Initiate a study to explore a requirement for energy upgrades at the time of renovation permit or, if appropriate, time of sale of property.

- Renovations are an appropriate time to require upgrades, while investments are being made.
- The sale of property can also be an opportune time to invest in building improvements if buildings have amassed equity.
- A market analysis can determine an appropriate scope of retrofit, which building types would be included, and whether the retrofit would be the responsibility of the buyer or the seller.
- Typically, any requirements at time of renovation or sale target only poor performers within a given building class or use. (e.g. bottom 20% in a Portfolio Manager use category)
- If favorable, the City could increase the performance improvement thresholds at time of renovation or sale of property.



1. ENERGY EFFICIENCY IN EXISTING BUILDINGS

1.1.4 O+M PLAN REQUIREMENT

Require submission of operation and maintenance plans as a condition of permitting.

- As a condition of building occupancy, applicants must submit energy management plans detailing how building operations will meet the intent of the energy efficient design.
- The City should establish a template for energy management plans based on existing frameworks that are common in the commissioning industry and are designed for simplicity and effectiveness
- Objective is to ensure *future* existing buildings perform optimally.
- Intent is to align requirements for these proposed O+M Plans with the plans contemplated for poor performing building as part of the new BEUDO requirements in action 1.1.2.



2. NET ZERO NEW CONSTRUCTION

Require low carbon new construction.



2. NET ZERO NEW CONSTRUCTION

2.1 CREATE NET ZERO TARGETS FOR NEW CONSTRUCTION

Set targets for net zero new construction in Cambridge by building type / sector.

Type:	Municipal	Residential	Multi-Family	Commercial	Institutional	Labs
Target Year:	2020	2022	2025	2025	2025	2030

- These target dates are proposed as policy goals for both industry and Cambridge staff to work toward.
- Regular meetings should be held with stakeholders to evaluate the evolving state of technology and construction practices as they relate to targets dates identified below.
- Cambridge staff will consult with industry and other key stakeholders at least two years in advance of proposing regulations requiring buildings to be net zero.



2. NET ZERO NEW CONSTRUCTION

2.2.1 MARKET BASED INCENTIVE PROGRAM

Provide a compelling incentive package to encourage private developers to exceed energy efficiency requirements.

- To achieve net zero buildings in ten years, financial mechanisms can motivate the market and accelerate innovation. (e.g. A performance fee and rebate system that rewards projects on a sliding scale based on energy performance.)
- The performance fee and rebate model relies upon fees and refunds based on the performance of a particular project. A formula determines the fee amount, and the refund amount is based on thresholds of energy performance.
- The approach should be initially tested by way of a limited pilot in residential sector first for new construction and major renovations where there is less complexity and shorter construction cycles.
- Incentive program in place by sector until the year when net zero construction is mandated.
- Once net zero new construction becomes a requirement, the incentive program can be modified to reward projects that are net-positive.



2. NET ZERO NEW CONSTRUCTION

2.2.2 HEIGHT + F.A.R. BONUS

Provide a compelling incentive package to encourage private developers to exceed energy efficiency requirements.

- To generate early action the City can explore the potential impact of offering additional floor area allowance and extra height to projects that achieve net zero emissions.
- Projects will need to demonstrate and commit to net zero emissions through their design in order to meet eligibility requirements for additional FAR award.
- A performance deposit should be held until 24 months following occupancy.
- Projects will also have to agree to share learnings on how net zero was achieved in their projects.
- This approach should be investigated in the context of other land use studies.



2. NET ZERO NEW CONSTRUCTION

2.3 INCREASE GREEN BUILDING REQUIREMENTS IN CAMBRIDGE ZONING ORDINANCE

Increase minimum green building requirements on a regular basis starting in 2015

- The incremental scaling up of green building requirements, benchmarked with real-world examples and cost benefit analysis, over time leading up to the specific net zero target dates identified for each building type.
- This includes a shift to LEED Gold city wide.
- With a distinct focus on energy efficiency and GHG emission reduction, the policy should require projects to pursue a prescribed number of LEED energy efficiency points, and enhanced commissioning requirements.
- The green building requirements in the Cambridge Zoning Ordinance currently apply to buildings 25,000 square feet or larger.
- Requiring incremental improvements in advance of the net zero targets sets industry on a trajectory to realize deep energy efficiency savings and better equips them to achieve the referenced targets.



LEADERSHIP IN
ENERGY AND
ENVIRONMENTAL
DESIGN

2. NET ZERO NEW CONSTRUCTION

2.4.1 NET ZERO REQUIREMENT FOR NEW CONSTRUCTION OF MUNICIPAL BUILDINGS

Introduce bold targets for new construction and energy performance improvements for existing municipal buildings.

- Establish a formal policy that new construction of municipal buildings should target net zero.
- Buildings must be designed to optimum energy efficiency standards such that all or a high percentage of energy loads could be met by renewable sources.
- Once there is improved local capacity, all new construction should achieve net zero (target date 2020), five years ahead of citywide requirement.
- Long term, require new construction to be net positive, (i.e. producing more energy than it consumes on an annual basis) exceeding the citywide requirement for net zero buildings.



2. NET ZERO NEW CONSTRUCTION

2.4.2 RENEWAL OF MUNICIPAL BUILDINGS

Introduce bold targets for new construction and energy performance improvements for existing municipal buildings.

- Develop a phased municipal building improvement strategy where
 - (1) greenhouse gas reduction is a priority when constructing facility improvement projects and
 - (2) operational improvements are implemented to achieve targets established and tracked by the Cambridge Department of Public Works.
- The strategy will involve continuous self-evaluation requiring increased performance levels as technology and local capacity is improved.
- Continue to implement municipal building improvement strategy that is informed by new technology and best practices, and track improvements (GHG reduction) annually.
- Continue to implement municipal building improvement strategy that is informed by new technology and best practices, and track improvements (GHG reduction) annually.



2. NET ZERO NEW CONSTRUCTION

2.5 REMOVAL OF BARRIERS TO INCREASED INSULATION

Resolve policy barriers to improving insulation of buildings

- Explore with advice from the Planning Board, Cambridge Inspectional Services the best method of allowing external insulation in built-out compact residential neighborhoods in a manner sensitive to historic preservation principles.
- Evaluate the success of the policy changes.
- Interview stakeholders and review planning approval if necessary to determine if the barrier removal has resulted in the desired outcome.
- Revise strategy if required.



3. ENERGY SUPPLY

Replace fossil fuels with low carbon energy.



3. ENERGY SUPPLY

3.1 LOW CARBON ENERGY SUPPLY STRATEGY

Define how the City will support the broad implementation and development of renewable and low carbon energy in Cambridge.

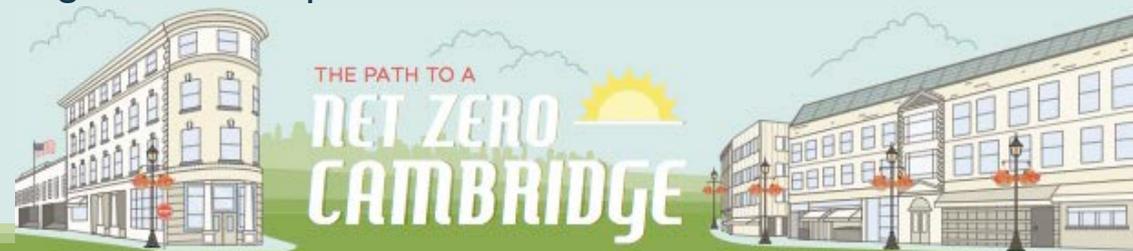
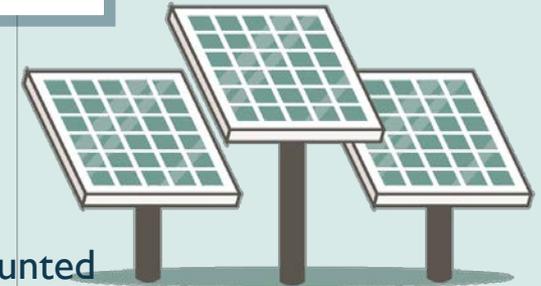
- The City will review what role(s) it can play in the procurement of additional green power supply through lobbying the State to increase the Renewable Portfolio Standard (RPS)⁹.
- The City will also review the potential for customer aggregation as a tool to further increase the supply of renewables to meet Cambridge municipal and residential needs, potentially in combination with non-profit or commercial energy users.
- Determine what the potential is for generating heat and electricity at the block, district, and city scale is and where in the city is best suited for such applications.
- The medium-term time horizon is the opportune time for City to consider developing or partnering on the expansion or development of district energy systems. This also the time horizon that a pilot for a small smart grid or block scale energy storage could be implemented.
- The development of larger smart grids and district scale energy systems could occur by 2025 and beyond.



3.2 ROOFTOP SOLAR READY REQUIREMENT

Develop “solar ready” requirements and explore renewable energy requirements.

- All new buildings should be ‘solar ready’ –
 - Designed to accommodate the installation of roof-mounted solar panels both photovoltaic and solar thermal.
- The requirements should be implemented with discretion in order to account for the ability of the roof to collect solar e.g. shading and large numbers of required roof penetrations would be considered.
- Explore the feasibility and financial implications of a solar energy generation requirement, e.g. 5-10% of a given building’s energy load.
- Undertake a feasibility analysis of applying the requirements for solar ready to major roof replacements.
- Investigate increasing renewable generation requirements.



3. ENERGY SUPPLY

3.3 DEVELOP A MEMORANDUM OF UNDERSTANDING WITH LOCAL UTILITIES

Cities can collaborate with utilities on projects of mutual interest that have resulted in energy use and emissions reductions.

- The declaration and definition of this collaboration can impact its effectiveness so a formal agreement on how the City of Cambridge, Eversource and Veolia can work together is recommended.
- Short term, develop a memorandum of understanding (MOU) based on areas of mutual interest and have senior officials meet regularly to monitor and manage progress.
- Explore if there is benefit to including the state government and regional partners to this collaboration.
- Medium term and long term, senior officials meet regularly to monitor and manage progress and further develop the MOU as new priorities and projects develop.



4. LOCAL CARBON FUND

Option to invest in a net zero community.



4. LOCAL CARBON FUND

INVESTIGATE LOCAL CARBON FUND

- Where it is not possible or is exceptionally challenging for individual projects to achieve net zero emissions through the combination of efficiency and renewable energy generation, an alternative approach is to introduce a locally managed carbon fund.
- Introduces the option, as an alternative to achieving net zero, to purchase carbon offsets on a voluntary basis.
- The proceeds of the carbon fund will support Cambridge-based greenhouse gas reduction initiatives and renewable or low-carbon energy projects.
- The objective of the fund should be to create a vehicle that is easy to use as a method to achieve net zero emissions over the short and medium term.
- In contrast to traditional offset frameworks, which typically are limited to supporting large-scale projects, a local carbon fund should be structured such that it can support a range of Cambridge-based emission reduction projects regardless of the scale of the project.



5. ENGAGEMENT + CAPACITY BUILDING

Industry training community involvement.



5. ENGAGEMENT AND CAPACITY BUILDING

5.1 COMMUNICATION STRATEGY

Develop a comprehensive long-term communications strategy around the Cambridge Net Zero objective.

Short Term

- Establish a communications network wherein partners and advocates use existing communications channels to engage the community around the net zero initiative. Partners with existing networks are trusted voices, whose endorsement can be invaluable in terms of generating support for the initiative.
- Develop (with the assistance of a public relations firm) a strong brand identity for the project such that the overarching project and related initiatives are easily recognizable by residents, visitors, and community members.
- A focus of this strategy should be to build upon the success already achieved to date in Cambridge and to celebrate the leadership of the very progressive development and real-estate community.



5. ENGAGEMENT AND CAPACITY BUILDING

5.1 COMMUNICATION STRATEGY

Develop a comprehensive long-term communications strategy around the Cambridge Net Zero objective.

Medium and Long Term

- Ensure that programs that rely on community uptake are communicated to their intended audiences in a simple and engaging manner. Program uptake is often closely tied to awareness and clarity of messaging.
- Maintain open channels of engagement with residents and businesses, such that their ideas are incorporated into the work, and their voices are heard.
- Use communications tools and campaigns to translate complex information to a format that is accessible and relatable to community members.
- Develop competitions, challenges and/or rewards program to generate buzz around net zero initiatives.
- Report regularly on progress toward target.



5. ENGAGEMENT AND CAPACITY BUILDING

5.2 DEVELOP ONGOING CAPACITY TO MANAGE GETTING TO NET ZERO PROJECT

Assign and commit to specific roles and responsibilities for implementing the Cambridge net zero initiative over the long term.

- Short term, develop action plan, assign roles and responsibilities and create a reporting structure.
- Medium term, conduct interim reviews, reports and refine the action plan.
- Long term, ongoing measurement, public reporting and process refinement.



5. ENGAGEMENT AND CAPACITY BUILDING

5.3 NET ZERO LAB STANDARDS

Through stakeholder engagement, develop new standards for lab operations that support lower energy use.

- Building on Cambridge's strength as a center of research and innovation, the development of new industrial hygiene standards that, for example, could lower ventilation standards and reduce other energy uses could be critical in achieving net zero labs.
- Develop a working group of industry stakeholders, research institutions and industrial hygienists to collaborate on new standards for reducing energy use that can be trialed without compromising safety or research integrity.
- Once the consensus is developed on new potential standards there will need to be pilots to test their effectiveness of the interventions and refined.
- Over the long term there will be a need for ongoing refinement of the standards as technology and practices develop.

