City of Cambridge Getting to Net Zero Action Plan 2015-2040

Presented at BuildingEnergy16 - March 9, 2016 by Susanne Rasmussen Director of Environmental & Transportation Planning





Net Zero Action Plan: The Impetus

- Significant construction activity in the city and concern that *any* new development makes reducing GHGs harder, unless Net Zero
- Zoning petition filed by residents requiring all new buildings to be Net Zero or annual offsets required (Connolly Petition)
- City Council instead charged Getting to Net Zero Taskforce with developing plan within 12 months
- Net Zero Action Plan adopted by Council on June 22, 2015



Goal is Game Changing

- All sectors are involved: government, universities, residents and business
- <u>How</u> do we get there, not <u>can</u> we get there?
- Demonstrates that bold strategies are needed. Current best practice won't get us there





A community of buildings for which, annually, all greenhouse gas emissions produced through building operations are offset by carbon-free energy production.





HOW TO ADDRESS CARBON REDUCTION

There are **J** ways to reduce emissions from buildings:

EFFICIENT DESIGN & RETROFITS

IMPROVED OPERATIONS

RENEWABLE ENERGY SUPPLY





TASK FORCE WORK PROGRAM



Electricity and natural gas have ENERGY USE IN been nearly flat over the last CAMBRIDGE decade. Year to year, use has varied due to variations in weather and economic activity. Electricity and Gas Use Electricity 80M 1500K 5% increase from 2003 Natural Gas (therms) 60M 2% decrease from 2003 Electricity (MWh) Natural Gas 1000K 40M 500K 20M 0K 0M 2003 2005 2010 2012 2004 2006 2008 2009 2007 2011

Source: NSTAR



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

FuelType Cambridge CO2 Emissions from Grid New England Electric Generation by Pumped Storage Electricity Fuel Type Renewables 100% Oil/Gas 10% 700K-13% Nuclear Oil 10% 10% 600K 80% Coal -22% Natural Gas 500K 27% CO2 (tonnes) 31% 60% 400K 6% 300K 40% 14% 200K-42% 20% 31% 100K 0K 0% 2003 2012 2003 2012 Sources: NSTAR and ISO-New England.



Estimated Energy Use by Space Type

Commercial Lab 21%	Commercial Offic	ce	Hotel 4%	>8 Unit Residential 10%	2-3 Fam 9%	nily
	Retail 2%	Hospital 2%		Warehouse		
-	Academic / Admini 5%		×	4-8 Unit Residential 4%	1-Family 3%	/
	University Resident 5%	ial Mus Sup	etics eums port %	Gov't 3%		Dther L%



CAMBRIDGE EMISSIONS REDUCTION MODEL



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.



1. Energy Efficiency in Existing Buildings

- 1.1.1 Custom Retrofit Program
- 1.1.2 Additional BEUDO Requirements
- 1.1.3 Upgrades at Time of Renovation or Sale
- 1.1.4 Operations and Maintenance Plan
- Requirement for New Construction



2. Net Zero New Construction

- 2.1 Create Net Zero Targets for New Construction
- 2.2 Net Zero Incentives
 - Market-based Incentive Programs
 - Height + FAR Bonus
- 2.3 Increase Green Building Requirements in the Cambridge Zoning Ordinance
- 2.4 Net Zero Requirement for New Construction +
- Deep Retrofits of Municipal Buildings
 - Net Zero Requirement for New Construction
 - Municipal Buildings Improvement Program
- 2.5 Removal of Barriers to Increased Insulation



Net Zero New Construction Targets

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

The **criteria** that will be evaluated in order to determine the the feasibility is:

- Number of Net Zero Buildings in that building type
- Technical feasibility/industry capacity
- Access to renewable energy
- Economics including NPV analysis
- Contribution to other goals such as resiliency

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



4. Local Carbon Fund Investigate Local Carbon Fund



5. Engagement & Capacity Building
5.1 Communication Strategy
5.2 Develop Ongoing Capacity to Manage
Getting to Net Zero Project
5.3 Net Zero Lab Standards and Maintenance
Plan Requirement for New Construction





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
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 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 Zero Net Zero Commercial Net Zero Net + Net Zero + Net Positive Targets Residential Municipal Multi-Family Labs Municipal 1-3 Units Institutional 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 Municipal A-Bioential Multi-Family Labs																			
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National Service Servic																			
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Action 4 - Local Carbon Fund																			
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Action 5 - Engagement and Capacity Building	nt and Capacity Building																		
5.1 Communication Strategy	Strategy																		
5.3 Net Zero Lab Standards	indards																		



SHORT TERM ACTIONS

				External St	udy		Program Pile	ot			Policy Pilot				Net Zero/Po:	sitive Target			Stakeholde Program W	er-Based /ide Review		
				Internal Stu	udy		Program Im	plementation			Policy Impler	nentation			Regulation Ir	mplementatio	n					
									Net Zero			Net Zero										
Net Zero + Net Positive Targets							Net Zero Municipal		Residential 1-3 Units			Commercial Multi-Family					Net Zero Labs					Net + Municipa
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1.1.1 Custom Retrofit Program	Residentia		Mult	Framily Pilot	Review.																	
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	AI	+		Design	Required C	LAM Plan																
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2.3 Increase Green Building Requirements in 1	Cambridge	Feasibilit		1 - New LEED Re		-4																
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2.4.1 Municipal Buildings 2.4.2 Renewal of Municipal Buildings		-	Action Plan	_	Pilots																	
2.5 Removal of Barriers to Increased Insulatio		Design		New Policy																		
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3.1 Low Carbon Energy Supply Strategy				Ready Requireme		Leev																
3.2 Rooftop Solar Ready Requirement 3.3 Develop a Memorandum of Understandin	ıg	Design Develop N			ent <mark>Study</mark>																	
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		Externally Led																				



MEDIUM TERM ACTIONS

				External Stu	idy		Program Pilo	ot			Policy Pilot				Net Zero/Po	sitive Target			Stakeholde Program W			
				Internal Stu	dy		Program Imp	olementation			Policy Imple	mentation			Regulation I	mplementation	n					
							Net Zero		Net Zero			Net Zero Commercial					Net Zero					Net +
Net Zero + Net Positive Targets							Municipal		Residential 1-3 Units			Multi-Famil Institutiona	y				Labs					Munici
	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 Buildi	ings																					
1.1.1 Custom Retrofit Program	Residential	Feasibility	Multi-	Family Pilot	Review		Potential Mult	i-Family Program	n	Review												
	All					Feasibility	Custom	Retrofit Pilot	Review	Custom												
1.1.2 BEUDO Additional Requirements	Comm. + MF			Design		New Building En	rgy Use Disclosi	ire Ordinance Re	iq's	Review	Version 2											
1.1.3 Upgrades at Time of Renovation or Sale	All			Fe	asibility		Potential T.O.S	/R. Requirement	s	Review	Potential T.C Requiremen	1.5/R. ts										
1.1.4 O+M Plan Requirement Comm. + M	1F (New Const.)			Design		Required	l O+M Plan		Review	Re	quired O+M Pla	n										
Action 2 - Net Zero New Construction																						
2.2.1 Market Based Incentive Program	Residential	Feasibility	Pilot	Residential	Review	Pot. Net0 Inc	entive Program	Review	Potenti	al Net+ Incentiv	e Program											
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2.2.2 Height + FAR Bonus		Feasibility	*	Pc	itential H+FAR Inc	entive Program		Review	Potentia	I H+FAR Incentiv	ve Program											
2.3 Increase Green Building Requirements in 0 Zoning Ordinance	-	Design	Stage	1 - New LEED Rev	quirements	Review		Stage 2 - New I	EED Requiremen	ts	Review											
2.4.1 Net Zero Requirement for New Construct Municipal Buildings	ion of	Design		Net Zero Read	lý	Review		Net Zer	o Required		Review											
2.4.2 Renewal of Municipal Buildings		Design A	Action Plan		Pilots		Stage 1	- Building Renew	al Strategy													
2.5 Removal of Barriers to Increased Insulatio	m	Design		New Policy		Review																
Action 3 - Energy Supply																						
3.1 Low Carbon Energy Supply Strategy		E.S.S. Study	**				Implem	ent Energy Supp	ly Strategy													
3.2 Rooftop Solar Ready Requirement		Design	Solar i	Ready Requireme	nt Study	1	Potential	Solar Requireme	nt Version 1													
3.3 Develop a Memorandum of Understandin with Local Utilities	ıg	Develop N	ICU		Util	ity Collaboration			Review	Potential 2r	nd Utility Collabs	oration										
Action 4 - Local Carbon Fund																						
4 Investigate Local Carbon Fund			Fe	asibility			Estab	olish Potential Co	2 Fund													
Action 5 - Engagement and Capacity Building	g																					
5.1 Communication Strategy				Design			impli	ement Communi	cation Strategy													
5.3 Net Zero Lab Standards		Feasibility ***	Dev. Standar	d	Pilot Standard	11		Implement Pr	otential Standard		Review											
				ge Master Plan	2.																	
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LONG TERM ACTIONS

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		Exte	ernal Study			Program Pilo	t			Policy Pilot				Net Zero/Po	sitive Target			Stakeholde Program W			
)	Inte	ernal Study			Program Imp	lementation			Policy Impler	nentation			Regulation Ir	mplementation	1					
let Zero + Net Positive Targets						Net Zero Municipal		Net Zero Residential 1-3 Units			Net Zero Commercial Multi-Family Institutional					Net Zero Labs					Net + Municip
YEAR (fiscal year July - June)	2015	2016 20	017 2	018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
tion 1 - Energy Efficiency in Existing Buildings																					
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1.2 Additional BEUDO Requirements Comm. + MF		Design		N	ew Building Ener	rgy Use Disclosu	re Ordinance Re	q's	Review		Ver	sion 2						Version 2			
1.3 Upgrades at Time of Renovation or Sale All			Feasibilit	ty		Potential T.O.S	'R. Requirement	s	Review					Review							
1.4 O+M Plan Requirement Comm. + MF (New Const.)			Design		Required	O+M Plan		Review		Required	i O+M Plan		Review		Require	d O+M Plan		Review		Required O+M P	Plan
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2.2 Height + FAR Bonus	Feasibility	*	Potentia	I H+FAR Incer	tive Program		Review	Potentia	I H+FAR Incentiv	e Program	Review		Potential H+FA	Incentive Progra	am	Review		Poten	tial H+FAR Incen	tive Program	
Increase Green Building Requirements in Cambridge Zoning Ordinance	Design	Stage 1 - New	LEED Requirem	ients	Review		Stage 2 - New L	EED Requirement	.s	Review		Stage 3 - New	LEED Requireme	its	Review		Stage 4	- Potential New	Green Building I	Requirements	
Net Zero Requirement for New Construction of Municipal Buildings	Design	Net			Review					Review					Review						
4.2 Renewal of Municipal Buildings	Design Ac	ction Plan	Pilots												Stage 2 - Buildir	ig Renewal Strati					
5 Removal of Barriers to Increased Insulation	Design	Ne	w Policy		Review								Nev	v Policy							
tion 3 - Energy Supply																					
1 Low Carbon Energy Supply Strategy	E.S.S. Study	**									Implement E	nergy Supply S	rategy								
2 Rooftop Solar Ready Requirement	Design	Solar Ready Re	equirement	Study		Potential S	Solar Requireme	nt Version 1						Р	otential Solar Re	equirement Vers	ion 2				
.3 Develop a Memorandum of Understanding with Local Utilities	Develop MC	ου		Utility	Collaboration			Review						Potenti	ial 2nd Utility Co	llaboration					
ction 4 - Local Carbon Fund																					
Investigate Local Carbon Fund		Feasibility										Establish Po	tential Co2 Fund								
ction 5 - Engagement and Capacity Building																					
1 Communication Strategy	Des	sign																			
3 Net Zero Lab Standards	Feasibility ***	Dev. Standard	Pilo	ot Standard 1	-					Review		Pilot Standard	12								
* 1	To occur as par	rt of Cambridge Mas	ster Plan proce	ess																	
**	To happen in co	onjunction with Ken	idall Square st	tudy																	
***	Externally Led																				



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 & impact / opportunity assessment when appropriate
- Regulations & incentives
- New construction & existing buildings
- Equally targets savings from all sectors (no one sector is punished)



SUPPORT FROM STAKEHOLDERS

Key Stakeholder meetings:

- Massachusetts Biotech Council
- Cambridge Sustainability Compact Steering

Committee

Massachusetts 2

Institute of

Technology

- Climate Protection Action Committee
- Cambridge Chamber of Commerce
- Cambridge Historical Commission Staff
- Cambridge Department of Public Works

Mass**Bio**

Cambridge Chamber of

merce



FISCAL YEAR 2016 ACTIONS

- Update Green Building Requirements in Zoning
 Ordinance
- 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

www.cambridgema.gov/Op/Pojecjs/Climate/netzerotaskforce

