



Meeting with
Town of
Hubbardston
May 14, 2019

COMMONWEALTH OF MASSACHUSETTS

*Charles D. Baker, Governor
Karyn E. Polito, Lt. Governor
Matthew A. Beaton, Secretary
Judith Judson, Commissioner*

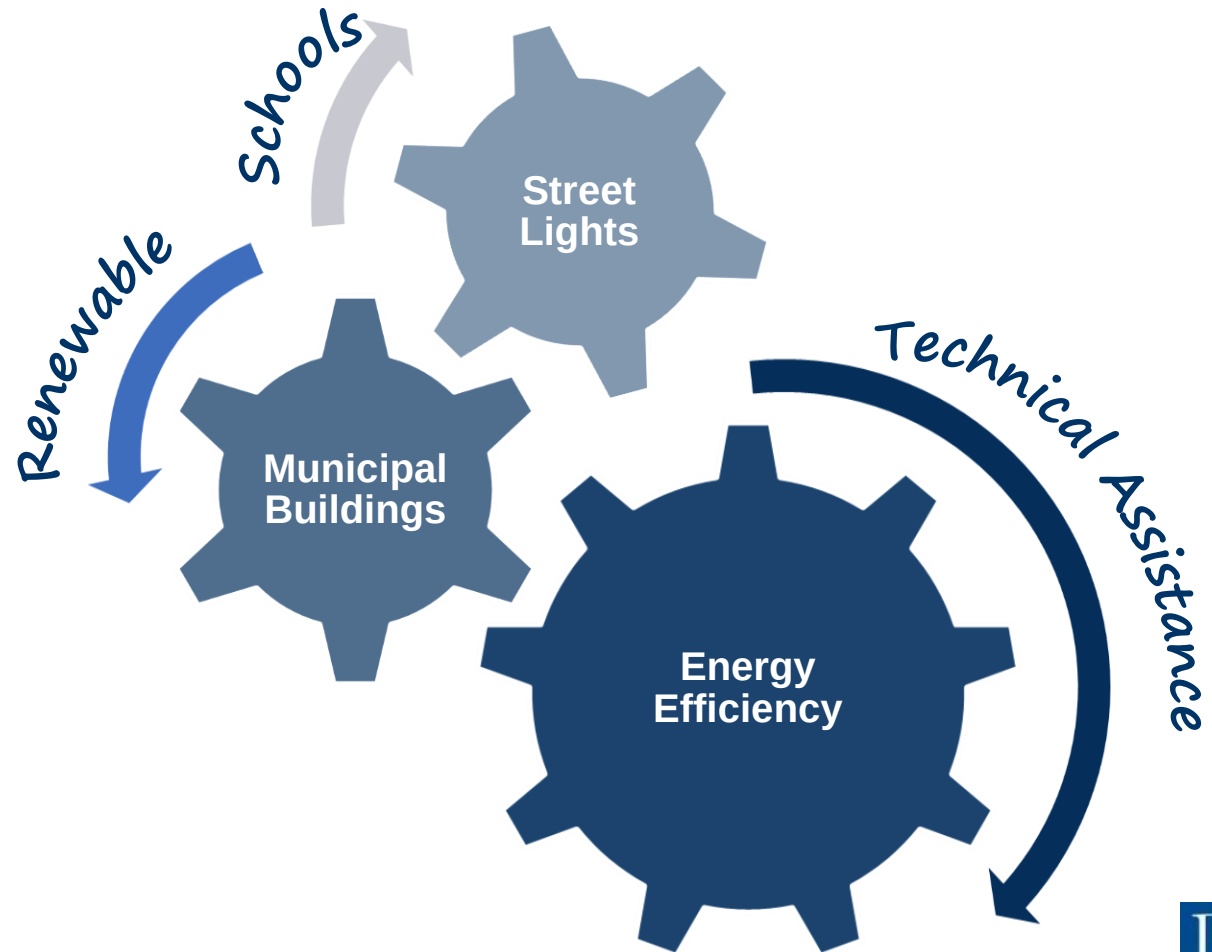
The Green Communities Division Partnering with Massachusetts Cities and Towns

*Jim Barry
Western Mass Regional Coordinator*

*Kelly Brown
Central Regional Coordinator*

Green Communities Division

The energy hub for ***all*** Massachusetts cities and towns, not just designated “Green Communities.”



Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth



Green Communities Designation and Grant Program

Provides up to \$20M annually in grants and loans to **Green Communities** (RGGI Auction proceeds and ACP funds)



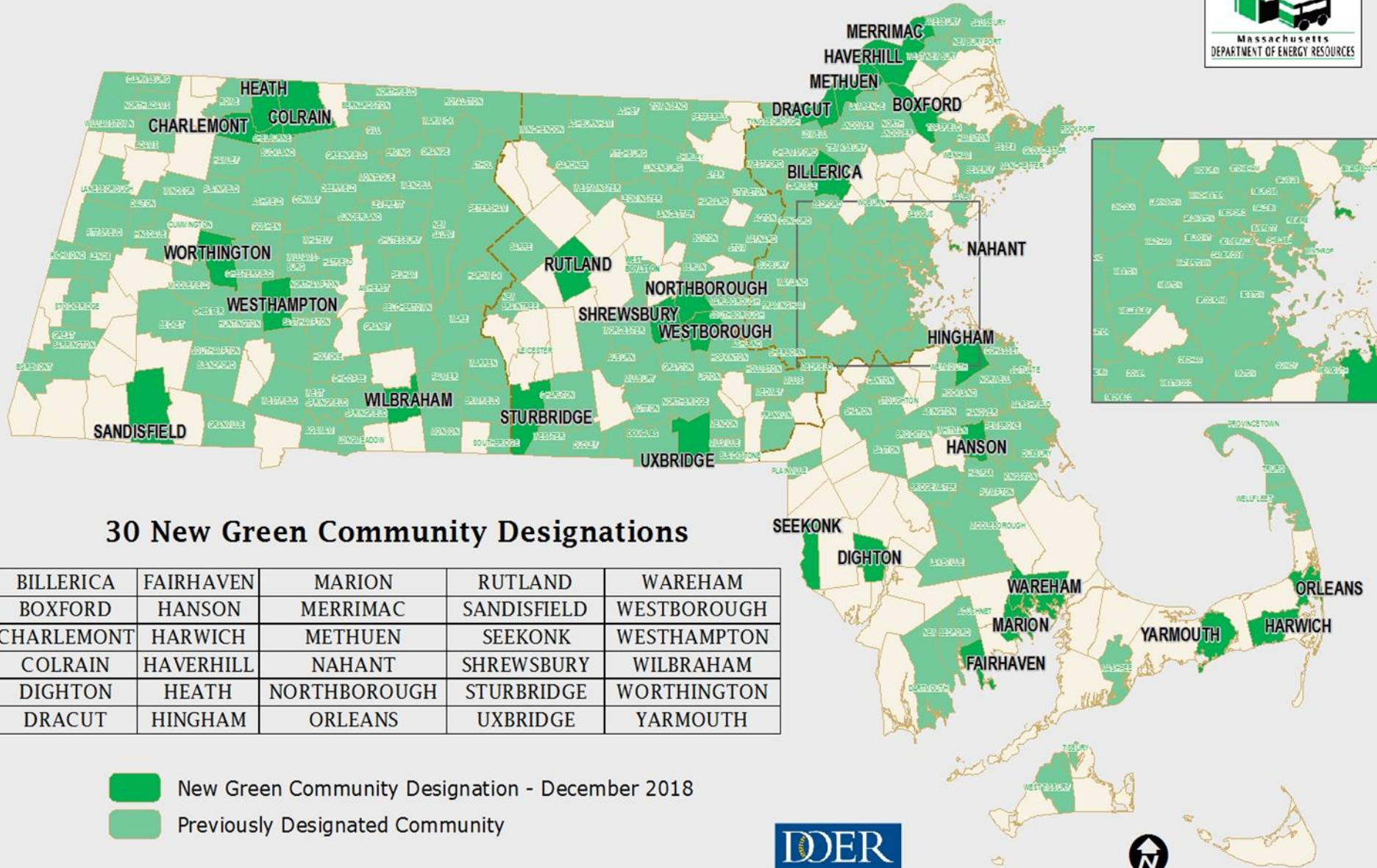
- Grants fund energy efficiency initiatives & renewable energy, innovative projects



Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth



GREEN COMMUNITY DESIGNATIONS REACH TWO HUNDRED FORTY



30 New Green Community Designations

BILLERICA	FAIRHAVEN	MARION	RUTLAND	WAREHAM
BOXFORD	HANSON	MERRIMAC	SANDISFIELD	WESTBOROUGH
CHARLEMONT	HARWICH	METHUEN	SEEKONK	WESTHAMPTON
COLRAIN	HAVERHILL	NAHANT	SHREWSBURY	WILBRAHAM
DIGHTON	HEATH	NORTHBOROUGH	STURBRIDGE	WORTHINGTON
DRACUT	HINGHAM	ORLEANS	UXBRIDGE	YARMOUTH

- New Green Community Designation - December 2018
- Previously Designated Community



J.Pfister, 12-27-18



NOT TO SCALE

20

Miles

Hubbardston's Neighboring Green Communities



Designation and Grant Program

- Designation Grant = \$125K + population & per capita income formula

Hubbardston estimated designation grant amount:

\$130,000

- Competitive Grants available annually, up to **\$250,000** per applicant, for existing Green Communities that have completed all prior grants
- Over \$100M awarded in total for both designation and competitive grant programs



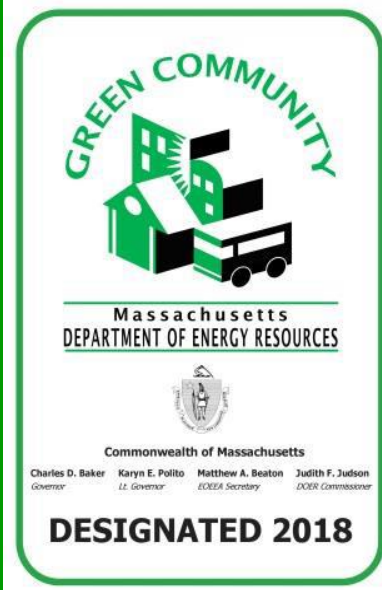
Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth



Green Communities Designation and Grant Program

Qualification Criteria – Designation

1. Adopt as-of-right siting for RE/AE generation, R&D, or manufacturing
2. Adopt expedited permitting process
3. Create an Energy Reduction Plan to reduce energy use by 20% in 5 years
4. Purchase only fuel-efficient vehicles
5. Minimize life cycle cost in new construction → adopt the Stretch Code

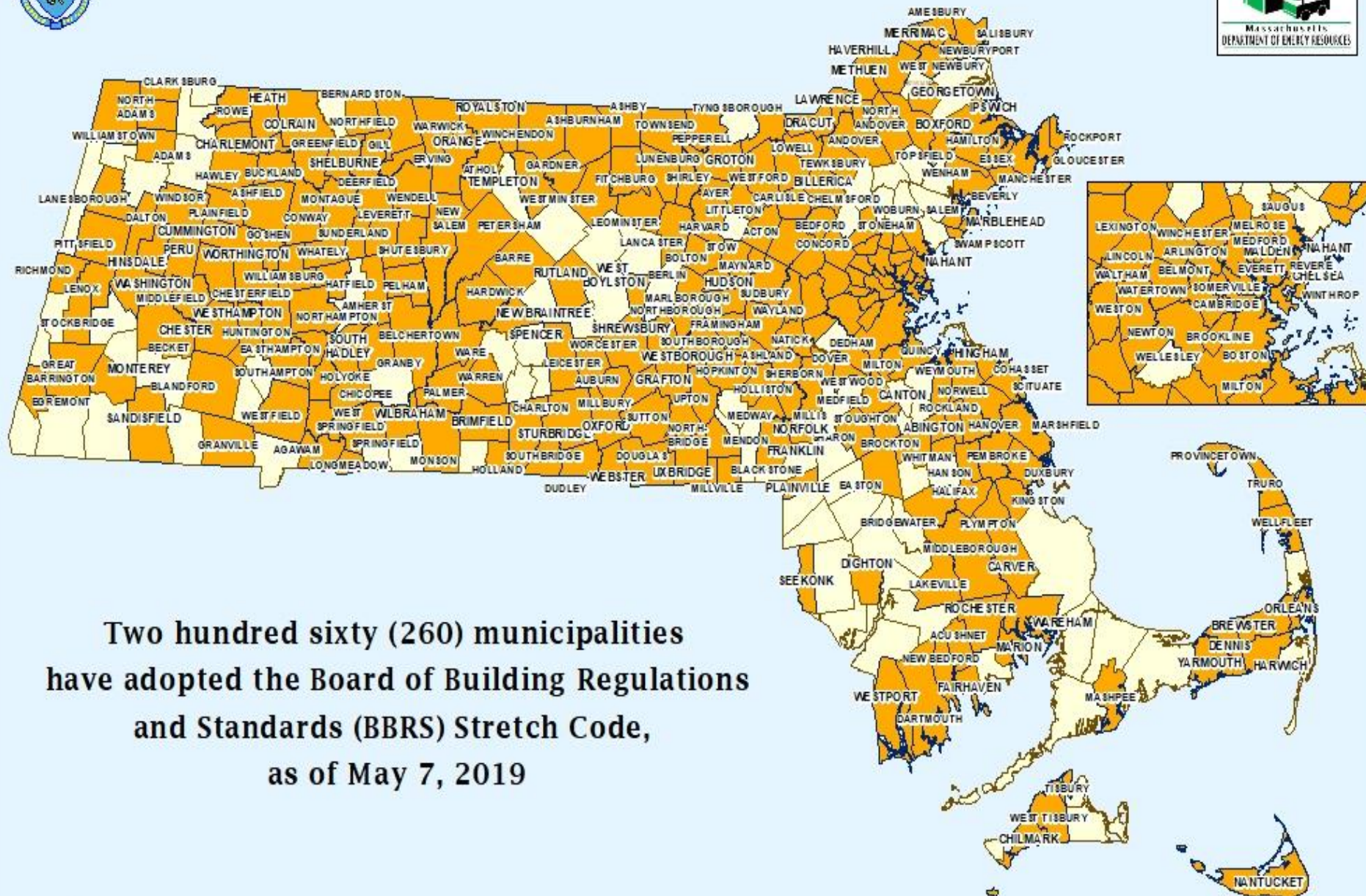
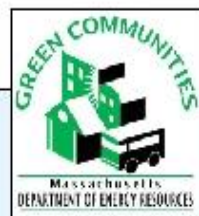


Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth





Stretch Code Adoption, by Community



Criteria 5 – Minimize Life Cycle Costs

Require all new. residential construction and all new commercial and industrial real estate construction to minimize, to the extent feasible, the life-cycle cost of the facility by utilizing energy efficiency, water conservation and other renewable or alternative energy technologies

The DOER recommended way for cities and towns to meet this requirement is by adopting the BBRS Stretch Code (780 CMR 115.AA) an appendix to the MA State Building Code.

In a town, the Stretch Code must be adopted as a general bylaw by its Town Meeting.



Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth



Stretch Code

- The Stretch Code **ONLY** applies to:
 - NEW residential construction and
 - NEW commercial construction > 100,000 sq. ft. or > 40,000 sq. ft. for conditioned spaces = Labs & Supermarkets
- Additions, Renovations & Repairs are EXEMPT from the Stretch Code



The Stretch Code is No Longer Much of a Stretch

- Base Energy Code (IECC 2015 with MA Amendments) and Stretch Code adopted by Massachusetts on 1/1/2017
- Current Base Code allows builders **two options** for residential and commercial new construction:

Prescriptive

- Checklist of Compliance Measures
- Inspections During and Post Construction

Performance

- Pre & Post Construction Energy Modeling
- Inspections During and Post Construction



The Stretch Code is No Longer Much of a Stretch

- Major differences between the Base & Stretch Code are:
 - Removal of the prescriptive path option
 - HERS Rater needs to provide an Energy Model.
 - The cost to perform the Stretch Code HERS modelling can be covered by utility incentive.

~~Prescriptive~~

- ~~• Checklist of compliance measures~~
- ~~• Inspections during and post construction~~

Performance

- Pre & Post construction energy modeling
- Inspections during and post construction



Why Test Performance?

- Prescriptive codes don't guarantee good installation, air and water tightness, or that thermal insulation is effective.
- Small air gaps can reduce insulation R-values by 50% or more.



What does Stretch Code Apply to?

Same application as the MA base energy code

- Insulation
- Doors, Windows, Skylights
- Mechanical Equipment
- Lighting
- Appliances
- Building tightness
- Duct tightness
- Renewables



Not required but 'points' given

What is HERS Process?

1. Review Building Plans via Computer Modeling
2. In-process inspections
 - First inspection
 - Thermal Bypass Checklist
 - Duct tightness test (if applicable)
 - Second Inspection (usually combined with 1st)
 - Insulation
 - Final Inspection
 - Blower door test
3. Finalize energy model based on verified performance and equipment



What is the HERS Process?

1. Review Building Plans via
Computer Energy Modeling = HERS 55
2. In-process inspections
 - First inspection
 - Duct tightness test (if applicable)*
 - Second Inspection
(usually combined with 1st)
 - Insulation
 - Final Inspection
 - Blower door test*
3. Finalize energy model based on
verified performance and equipment
= HERS 55 or lower

*Required by Base Energy Code 2015 IECC



What is a HERS Rating? (Home Energy Rating System)

Annualized energy analysis

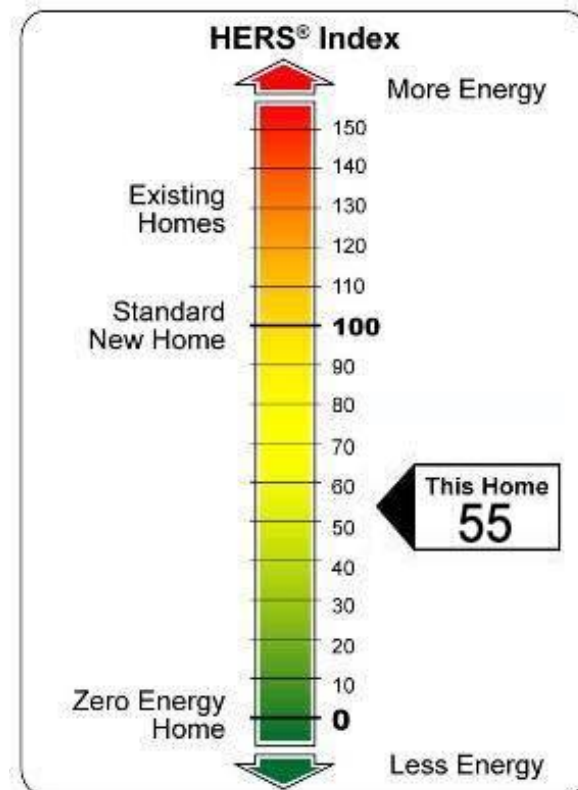
Heating, Cooling, Water Heating,
Lighting and Appliances....

On site power generation-renewable energy

Reference Home

- Based on IECC **2006** Code
(International Energy Conservation Code)
Defined as 100 Points
- 1 percent change in consumption = 1 point

**HERS 55 means about
45% more efficient than reference home**



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Propane Heat
Worcester, MA



HERS Index (ERI)

Target	55
Example Base	66
Example Stretch	55

Costs and Benefits to Meet Stretch Code

COSTS		BENEFITS	NET	
BUILDER	Adjustments + HERS Rater Fee		Utility Rebates ¹	
	+\$ (2,606)		-\$1,626	
HOMEBUYER	Change to Downpayment ³	Change to Annual Mortgage Payment ³	Estimated Reduced Energy Cost per Year ²	Year 1 Cash Flow
	+\$ (98)	+\$ (77)	-\$475	\$299
				Year 2+ Cash Flow
				\$397

1 – Incentives are determined using the Blended Savings Approach calculator. Savings compared to MA reference home.

BSA Incentive = \$0.35 * kWh savings + \$35 * MMBtu savings + \$3000 * 0.xx percent savings (single family home)

2 – Energy costs are based on 19 cents/kWh, \$0.97/therm, \$2.88 gal propane, \$2.58 gal oil. Savings are compared with Base Code home

3 – 30-year mortgage assumes 10% down payment at 4% APR



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Propane Heat
Worcester, MA



Breakdown of Construction Costs to Meet Stretch Code

FEATURE	Base Code	Stretch Code	Construction Cost
HERS RATING	66	55	\$500
WINDOWS (U-VALUE/SHGC)	.30/.30	.27/.30	\$500
HEATING	92% propane furnace	96% propane furnace	\$290
COOLING	13 SEER	15 SEER	\$392
DHW	0.62 EF 40 Gallon tank Propane	0.94 EF Tankless Propane	\$724
DUCT LEAKAGE TO OUTSIDE	4 CFM25 / 100 CFA	2 CFM25 / 100 CFA	\$200
AIR INFILTRATION	3.0 ACH50	<i>No change required</i>	\$0
HIGH EFFICACY LIGHTING	100% CFL	<i>No change required</i>	\$0
FOUNDATION	Unconditioned, uninsulated basement	<i>No change required</i>	\$0
FLOOR	R38 fiberglass Grade 1	<i>No change required</i>	\$0
WALLS	R21 fiberglass Grade 1	<i>No change required</i>	\$0
CEILING – FLAT	R-50 blown in cellulose	<i>No change required</i>	\$0
TOTAL			\$2,606

9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Oil Heat
Worcester, MA



HERS Index (ERI)

Target	55
Example Base	70
Example Stretch	54

Costs and Benefits to Meet Stretch Code

COSTS		BENEFITS	NET	
BUILDER	Adjustments + HERS Rater Fee		Utility Rebates ¹	
	+\$ (4,011)		-\$1,593	
HOMEBUYER	Change to Downpayment ³	Change to Annual Mortgage Payment ³	Estimated Reduced Energy Cost per Year ²	Year 1 Cash Flow
	+\$ (241)	+\$ (192)	-\$697	\$262
				Year 2+ Cash Flow
				\$505

1 – Incentives are determined using the Blended Savings Approach calculator. Savings compared to MA reference home.

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2 – Energy costs are based on 19 cents/kWh, \$0.97/therm, \$2.88 gal propane, \$2.58 gal oil. Savings are compared with Base Code home

3 – 30-year mortgage assumes 10% down payment at 4% APR



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Oil Heat
Worcester, MA



Breakdown of Construction Costs to Meet Stretch Code

FEATURE	Base Code	Stretch Code	Construction Cost
HERS RATING	70	54	\$500
WINDOWS (U-VALUE/SHGC)	.30/.30	.27/.30	\$500
HEATING	83% oil furnace	96% oil furnace	\$1,759
COOLING	13 SEER	15 SEER	\$392
DHW	0.95 EF Tank Electric	3.24 EF Heat Pump DHW	\$660
DUCT LEAKAGE TO OUTSIDE	4 CFM25 / 100 CFA	2 CFM25 / 100 CFA	\$200
FOUNDATION	Unconditioned, uninsulated basement	No change required	\$0
FLOOR	R38 fiberglass Grade 1	No change required	\$0
WALLS	R21 fiberglass Grade 1	No change required	\$0
HIGH EFFICACY LIGHTING	100% CFL	No change required	\$0
CEILING – FLAT	R-50 blown in cellulose	No change required	\$0
DUCT INSULATION	R-8	No change required	\$0
TOTAL			\$4,011



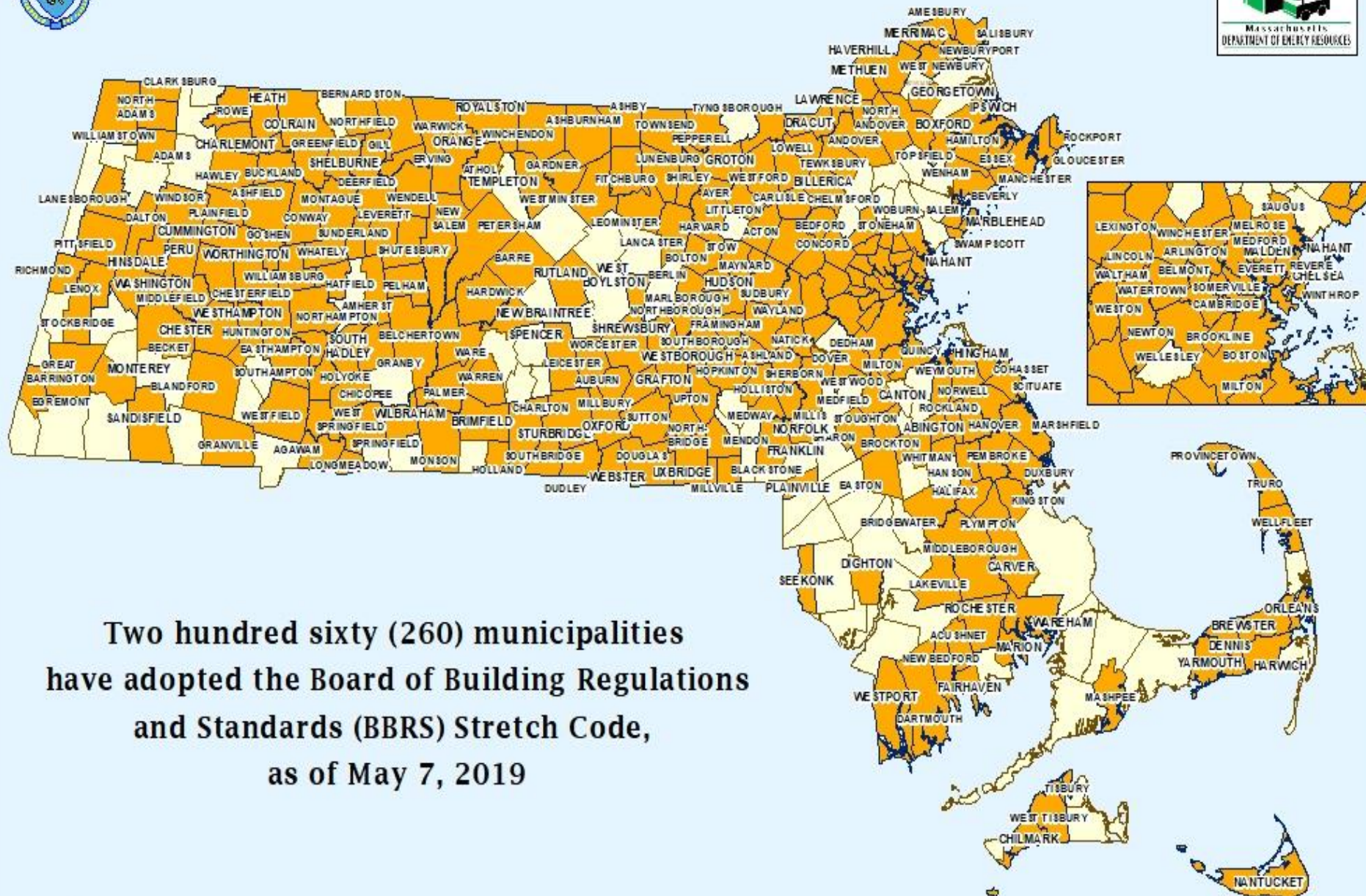
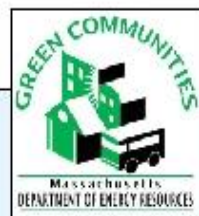
Commercial Stretch Energy Code 2017

- Large Commercial = Annual Energy use 10% below ASHRAE 90.1-2013 - Appendix G modeling
 - Appendix G also used for LEED certification
- Applies to:
 - New construction **over 100,000 sq./ft.**
 - Labs, Supermarkets, conditioned warehouses over 40,000 sqft
 - Additions, renovations and repairs are exempt





Stretch Code Adoption, by Community



**Two hundred sixty (260) municipalities
have adopted the Board of Building Regulations
and Standards (BBRS) Stretch Code,
as of May 7, 2019**

2017 Stretch Code Summary

- 1. The Stretch Code is no longer much of a Stretch ... Base Code ‘caught up’ to it.**
- 2. You do need a HERS Rater’s involvement but the Base code requires one also.**
- 3. The extra cost for the extra involvement is offset by the Mass Save Residential New Construction Program**
- 4. Additions, renovations and repairs to existing residential homes are EXEMPT**



Green Communities Contacts

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Kelly Brown – Regional Coordinator

Kelly.Brown@State.MA.US (508) 767-2703



Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Electric Heat Pump
Worcester, MA



HERS Index (ERI)

Target	55
Example Base	66
Example Stretch	54

Costs and Benefits to Meet Stretch Code

Example Stretch	54	COSTS		BENEFITS	NET	
BUILDER	Adjustments + HERS Rater Fee		Rebates ¹	Cost Compared to Base Code		
	+\$(2,360)		-\$4,900	\$2,540		
HOMEBUYER	Change to Downpayment ³	Change to Annual Mortgage Payment ³	Estimated Energy Cost Savings per Year ²	Year 1 Cash Flow	Year 2+ Cash Flow	
	-\$254	-\$202	-\$704	\$1,160	\$906	

1 – Incentives are determined using the Blended Savings Approach calculator. Savings compared to MA reference home.

BSA Incentive = \$0.35 * kWh savings + \$35 * MMBtu savings + \$3000 * 0.xx percent savings (single family home)

\$3,000 incentive available from Massachusetts DOER Alternative Energy Portfolio Standard

2 – Energy costs are based on 19 cents/kWh, \$0.97/therm, \$2.88 gal propane, \$2.58 gal oil. Savings are compared with Base Code home

3 – 30-year mortgage assumes 10% down payment at 4% APR



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Electric Heat Pump
Worcester, MA



Breakdown of Construction Costs to Meet Stretch Code

FEATURE	Base Code	Stretch Code	Construction Cost
HERS RATING	66	54	\$500
WINDOWS (U-VALUE/SHGC)	.30/.30	.27/.30	\$500
DHW	0.95 EF Tank Electric	3.24 EF Heat Pump DHW	\$660
HEATING	10 HSPF / 19 SEER Heat Pump	12 HSPF / 19 SEER Heat Pump	\$500
COOLING			
DUCT LEAKAGE TO OUTSIDE	4 CFM25 / 100 CFA	2 CFM25 / 100 CFA	\$200
FOUNDATION	Unconditioned, uninsulated basement	<i>No change required</i>	\$0
FLOOR	R38 fiberglass Grade 1	<i>No change required</i>	\$0
WALLS	R21 fiberglass Grade 1	<i>No change required</i>	\$0
HIGH EFFICACY LIGHTING	100% CFL	<i>No change required</i>	\$0
CEILING – FLAT	R-50 blown in cellulose	<i>No change required</i>	\$0
AIR INFILTRATION	3.0 ACH50	<i>No change required</i>	\$0
TOTAL			\$2,360

9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Natural Gas Heat
Worcester, MA



HERS Index (ERI)

Target	55
Example Base	66
Example Stretch	55

Costs and Benefits to Meet Stretch Code

COSTS		BENEFITS	NET	
BUILDER	Adjustments + HERS Rater Fee		Utility Rebates ¹	
	+\$ (2,606)		-\$1,630	
HOMEBUYER	Change to Downpayment ³	Change to Annual Mortgage Payment ³	Estimated Reduced Energy Cost per Year ²	Year 1 Cash Flow
	+\$ (97)	+\$ (77)	-\$213	\$37
				Year 2+ Cash Flow
				\$135

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3 – 30-year mortgage assumes 10% down payment at 4% APR



9th Edition Stretch Code Modeling Analysis

2550 sq.ft. 3 BR Single Family Home with Natural Gas Heat
Worcester, MA



Breakdown of Construction Costs to Meet Stretch Code

FEATURE	Base Code	Stretch Code	Construction Cost
HERS RATING	66	55	\$500
WINDOWS (U-VALUE/SHGC)	.30/.30	.27/.30	\$500
HEATING	92% gas furnace	96% gas furnace	\$290
COOLING	13 SEER	15 SEER	\$392
DHW	0.62 EF 40 Gallon tank Gas	0.96 EF Tankless Gas	\$724
DUCT LEAKAGE TO OUTSIDE	4 CFM25 / 100 CFA	2 CFM25 / 100 CFA	\$200
HIGH EFFICACY LIGHTING	100% CFL	<i>No change required</i>	\$0
AIR INFILTRATION	3.0 ACH50	<i>No change required</i>	\$0
FOUNDATION	Unconditioned, uninsulated basement	<i>No change required</i>	\$0
FLOOR	R38 fiberglass Grade 1	<i>No change required</i>	\$0
WALLS	R21 fiberglass Grade 1	<i>No change required</i>	\$0
CEILING – FLAT	R-50 blown in cellulose	<i>No change required</i>	\$0
TOTAL			\$2,606