



COMMONWEALTH OF MASSACHUSETTS

*Charles D. Baker, Governor
Karyn E. Polito, Lt. Governor
Matthew A. Beaton, Secretary
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The Green Communities Division Partnering with Massachusetts Cities and Towns

Stretch Code
Presentation
Town of Sturbridge
May 15, 2018

*Jim Barry
Western Mass Regional Coordinator*

Green Communities Designation and Grant Program

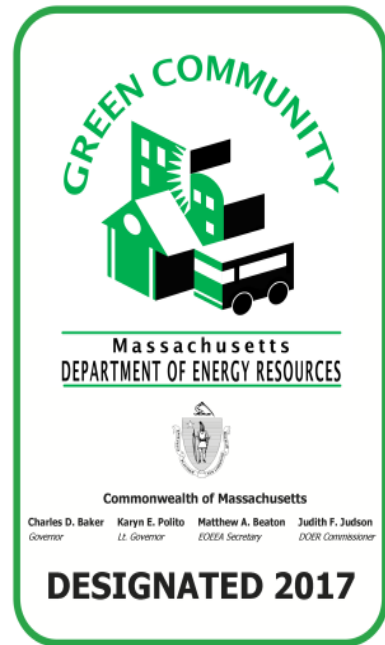
Provides up to \$20M annually in grants and loans to *qualifying communities* (RGGI Auction proceeds and ACP funds)

–Grants will fund significant energy efficiency initiatives, renewable energy, innovative projects

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

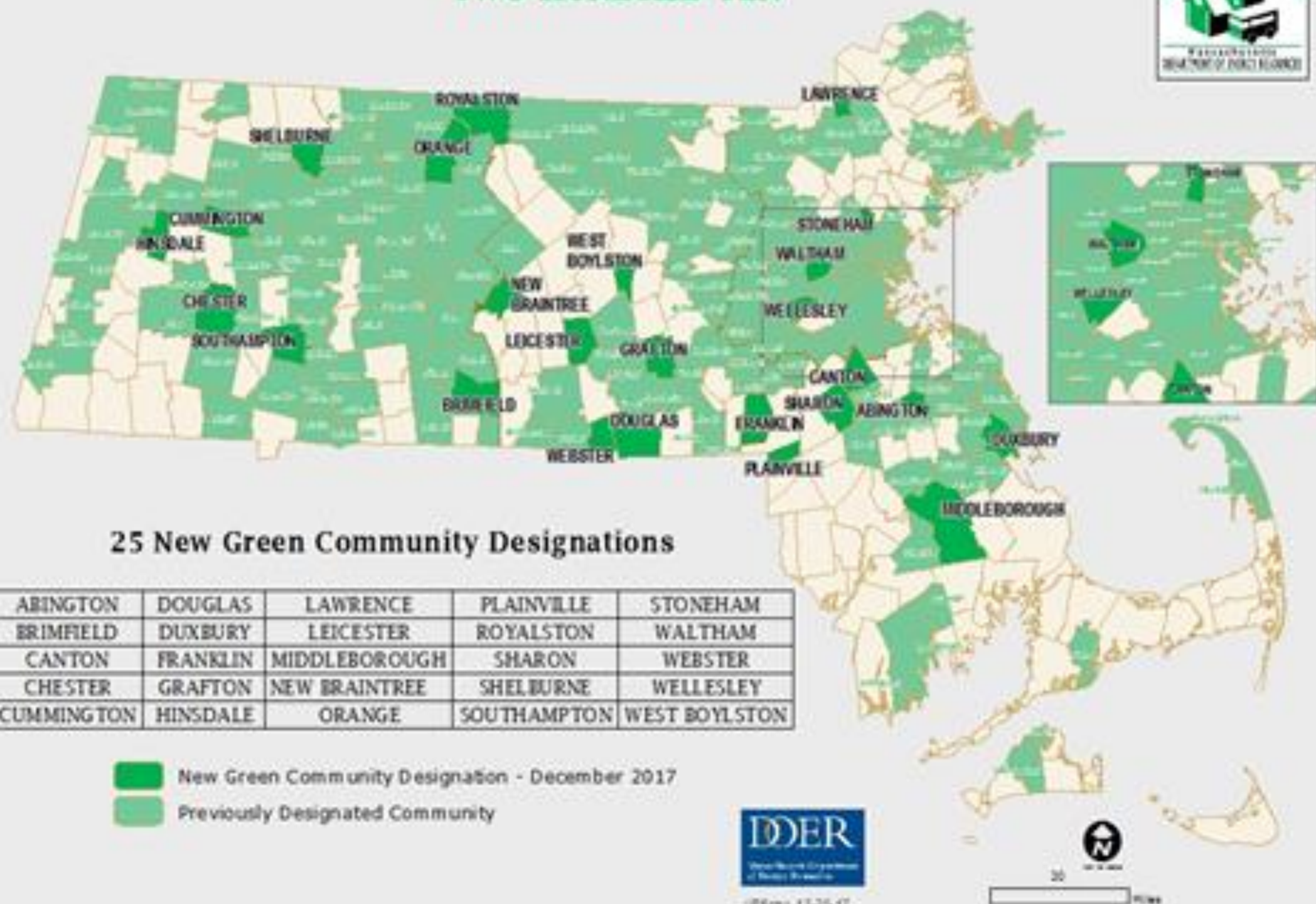


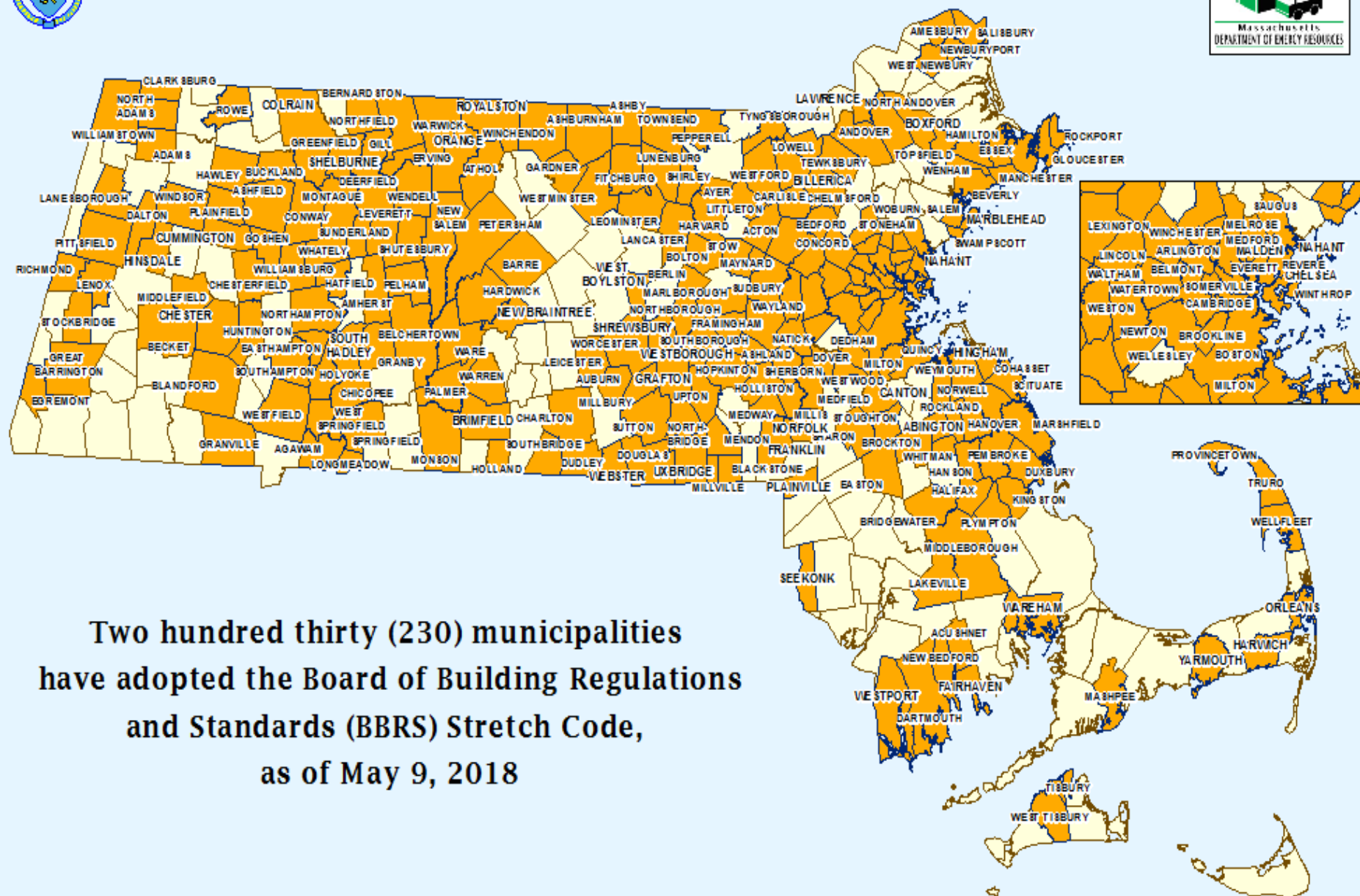
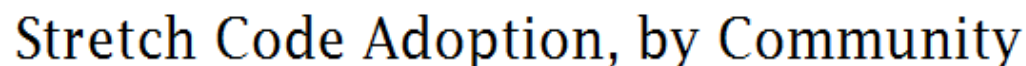
Green Communities Designation and Grant Program – the 210

- Communities receive 4 Road Signs and Official Certificate
- Designation grant allocations based on a \$125K base plus a population/per capita income formula; maximum \$1M.
 - Range from \$130,725 in Hatfield to \$1M for Boston
 - Sturbridge estimated grant amount \$140,000
- Competitive grants available annually up to \$250,000 per applicant for Green Communities that have expended all prior grant funds.
- More than \$80M awarded in total for both designation and competitive grant programs
- Projects being funded include electric and thermal (natural gas and oil) energy conservation measures, incremental costs for hybrid vehicles and grant administration costs



GREEN COMMUNITY DESIGNATIONS REACH TWO HUNDRED TEN





**Two hundred thirty (230) municipalities
have adopted the Board of Building Regulations
and Standards (BBRS) Stretch Code,
as of May 9, 2018**

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 old MIS-conceptions

- ‘Stretch Code is new and experimental.’
No; It is based on Energy Star for Home
- ‘Stretch Code requires tight unhealthy homes’
No; Building science has evolved
- ‘Homes w/ oil heat can’t meet the Stretch Code’
No; It is easier to meet SC with gas, but ...
- ‘Town residents will be required to update their existing homes’
No; New Stretch Code only applies to **NEW** residential construction and explicitly exempts additions, renovation & repairs



The Stretch Code is no longer much of a Stretch

8 or 9 years ago, the Stretch Code WAS a bit of a stretch compared to the base energy code (IECC 2009).

But on July 1, 2014 a new base energy code (IECC 2012) took effect. It required blower door tests and increased insulation levels in walls and attics. Your town had operated under that more energy efficient code for 3 ½ years

That base code “caught up” with the Stretch Code and some builders say that the Stretch Code was ‘easier’ to comply with than that 2012 Code (insulation levels for example...)



The Stretch Code is no longer much of a Stretch

January 1, 2017 – there is now a NEW base energy code (IECC 2015) and an associated NEW Stretch Code which is almost NO Stretch at all.

Basic difference in cost is for a HERS Energy Rater which is required by Stretch Code for new residential construction. Total additional costs are between \$1,600 and \$3,000 for typical single family home. MassSave rebate covers most of this extra cost: \$1,300 - \$1,700.

And home owner receives annual energy cost savings year after year after year.



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



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

Criteria #5: Require new buildings to be more Energy Efficient

Municipalities can meet this criteria by adopting the new BBRS Stretch Code

- Stretch Code is an optional appendix to the 9th Edition of the Mass Building Code 780 CMR
- Similar process to Energy Star for Homes
- Training for Building Officials has been done
- Provides for Performance testing, rather than Prescriptive measures.



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 is a HERS Rating? (Home Energy Rating System)

Annualized energy analysis

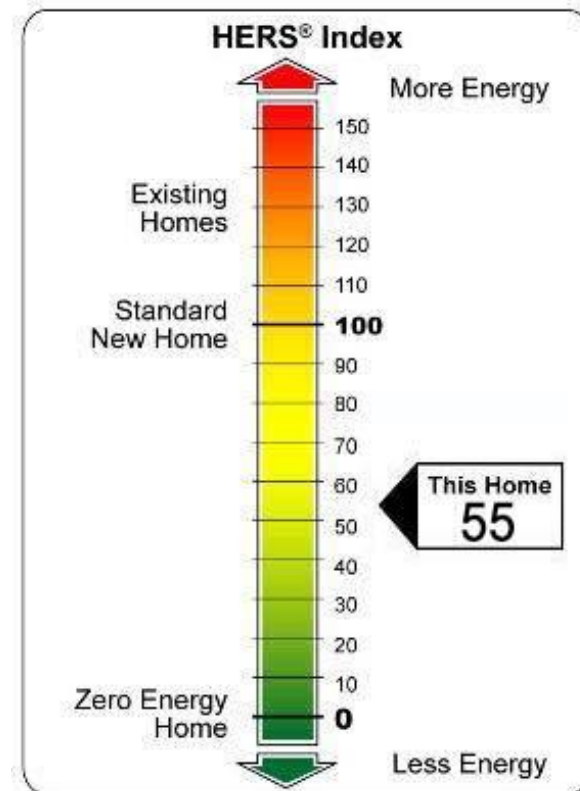
Heating, Cooling, Water Heating,
Lighting and Appliances....

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**



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



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.

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 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



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

BSA - Incentive

- Builder Incentive
 - $A * kWh + B * MMBtu + C * \%Savings$
 - $A = \$0.35/kWh$
 - $B = \$35.00/MMBtu$
 - $C = \$3,000$ single family (1-4 units)
 - $= \$2,000$ multifamily (5+ units)
- Rater Incentive:
 - \$350 Single Family (1-4 units)
 - \$100 Multifamily (5+ units)
 - \$50 Failed Unit

Commercial Stretch Energy Code 2017

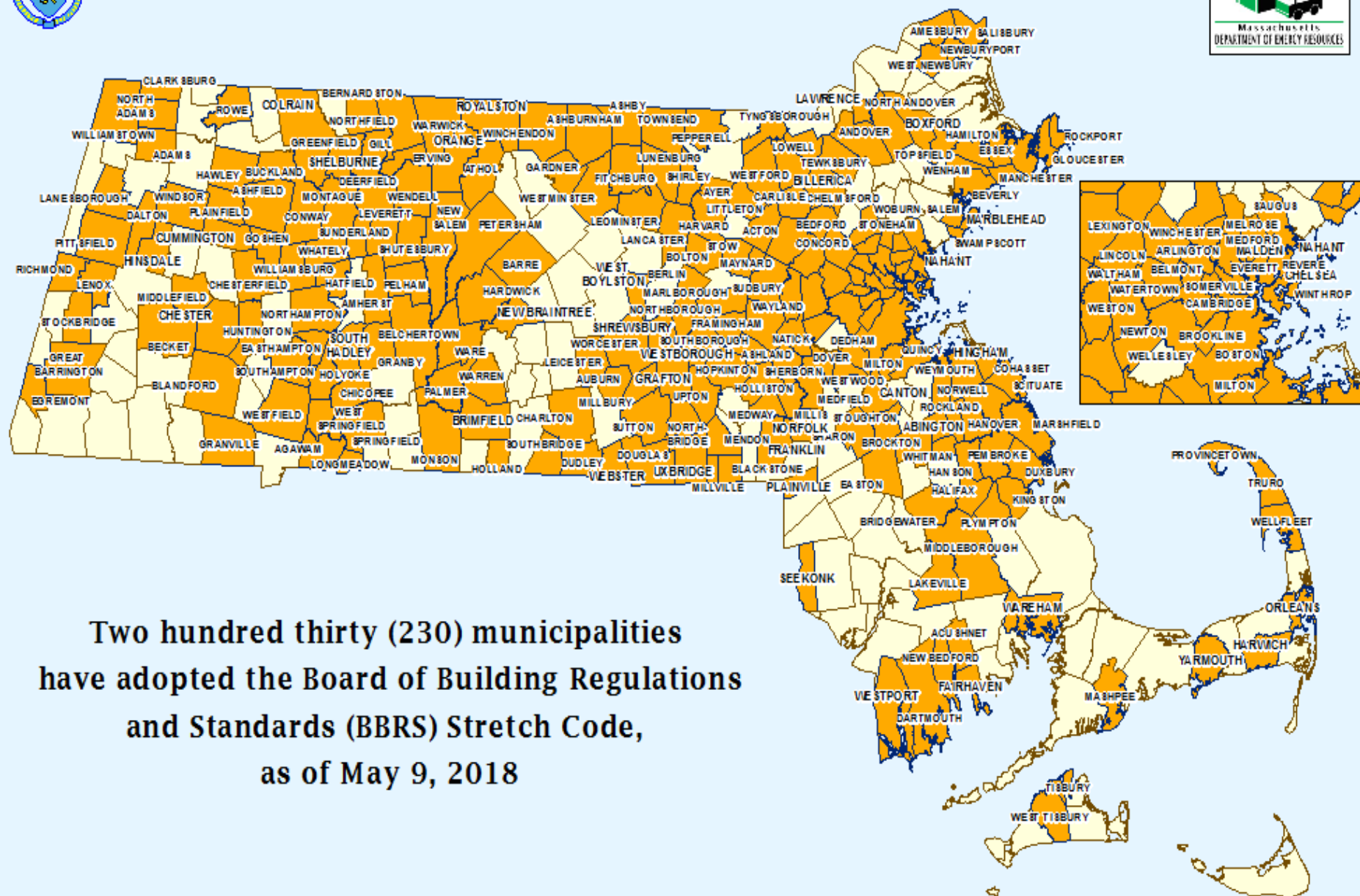
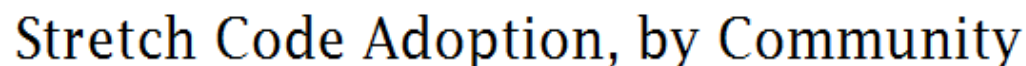
- Large Commercial = Annual Energy use 10% below ASHRAE 90.1-2013 - Appendix G modeling
 - Appendix G also used for LEED certification
- Applies to:
 - New construction **over 100,000 sq./ft.**
 - Labs, Supermarkets, conditioned warehouses over 40,000 sqft
 - Additions, renovations and repairs are exempt



Stretch Code Documentation

- Residential HERS rater requirements
 - Permit – Plan Review submittal with projected HERS rating ‘based on plans’
 - Certificate of Occupancy – Certified HERS index score based on final blower-door, duct testing
- Large Commercial – Energy Model requirements
 - Plan review – ASHRAE 90.1 Appendix G energy model submitted with plans
 - Certificate of Occupancy – Final energy model showing as-built building meets 10% savings





**Two hundred thirty (230) municipalities
have adopted the Board of Building Regulations
and Standards (BBRS) Stretch Code,
as of May 9, 2018**

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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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 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	Cost Compared to Base Code	
	+\$(2,606)		-\$1,630	\$(976)	
HOMEBUYER	Change to Downpayment ³	Change to Annual Mortgage Payment ³	Estimated Reduced Energy Cost per Year ²	Year 1 Cash Flow	Year 2+ Cash Flow
	+\$ (97)	+\$ (77)	-\$213	\$37	\$135

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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