VERMONT ENERGY INVESTMENT CORPORATION

Memo

To:	**John Bolduc**
From:	**Richard Faesy, Alison Hollingsworth**
Date:	**June 30, 2009**
Re:	**Cambridge Stretch Code Modeling**

This memo describes the energy modeling and cash flow exercise done for the city of Cambridge to compare a typical Cambridge triple-decker rehabilitation project against the proposed Massachusetts "Stretch Code".

The purpose of 780 CMR 120.AA "Appendix 120.AA 'Stretch' Energy Code" is to offer a more stringent energy code than the base energy code for both new construction and existing buildings. The focus of this work was for existing buildings. The two compliance paths for section 101.4.5 Residential alterations, renovations or repairs are:

- Prescriptive path for alterations, renovation or repairs which requires compliance with the most recent Energy Star for Homes Prescriptive Builders Option Package (BOP), except for heating and cooling equipment and appliances. Also the envelope insulation shall meet or exceed IECC 2009 requirements for climate zone 5, or fully fill existing cavities with insulating material which meets or exceeds an R value of R 3.7/inch.

- Performance option for alternations, renovations or repairs. The performance path may be followed in lieu of the prescriptive requirements with the following HERS rating requirements:

  For units greater than 2,000 sq ft in conditioned floor space, a HERS rating of 80 or less is required.

  For units less than 2,000 sq ft, a HERS rating of 85 or less is required.

  Compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist1.

This modeling exercise focused on the performance path for a typical Cambridge building. We were given plans from Dingman Allison Architects for a three unit, triple-decker building located on Magazine Street in Cambridge, MA. We entered the building dimensions and characteristics into REM/rate modeling software and added efficiency improvements to achieve both HERS ratings of 85 and 80. Under the Stretch Code, a HERS rating of 85 would be required for major residential rehab projects under 2,000 sq ft; projects involving over 2,000 sq ft. must achieve a rating of 80.

First, we analyzed if it was feasible for this type of building to meet the stretch code. Second we analyzed if the whole-house improvements would be cost effective as defined by leveraging the energy cost savings to pay for the efficiency upgrades through a 30 yr mortgage at 6% interest rate. This analysis does not consider any utility or government incentives that would likely be available for home-owners in Massachusetts.

Our results show that it is cost effective for a triple-decker to meet the conditions defined by the performance path of the Massachusetts Stretch Code. The results of the cash flow and the assumptions are attached.

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Cambridge Triple Decker Cash Flow
Whole House Analysis

	Existing Home	Stretch Code	
	Baseline	**Upgrade 1**	**Upgrade 2**
HERS Index Modeled in REM/Rate	**143**	**85**	**80**
Improvement Measures (changes relative to base-case)	- Unconditioned basement - No foundation wall or frame floor insulation - No wall insulation - R-10 ceiling insulation - (3) Gas boilers .80 AFUE - (3) Gas tanks .59 EF - No CAC/ducts (boiler) - No mechanical ventilation - Existing vinyl replacement windows - 10.73 ACH @ 50 Pa	- Wall insulation R13 G1 - Ceiling insulation R30 G2 - Finished basement with R13 G2 - 5 ACH @ 50 PA - Bathfan	- All measures in Upgrade 1 - (3) Gas Boiler with 86% AFUE
Improvement Costs		$ 14,847	$ 29,395
Mortgage Interest Rate		6%	6%
Loan Term (Years)		30	30
Annual Incremental Mortgage Payment		$ 1,079	$ 2,135
Annual Energy Costs	$ 9,719	$ 6,992	$ 6,682
Annual Energy Savings from Baseline		$ 2,727	$ 3,037
Annual Cash Flow		**$ 1,648**	**$ 902**

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