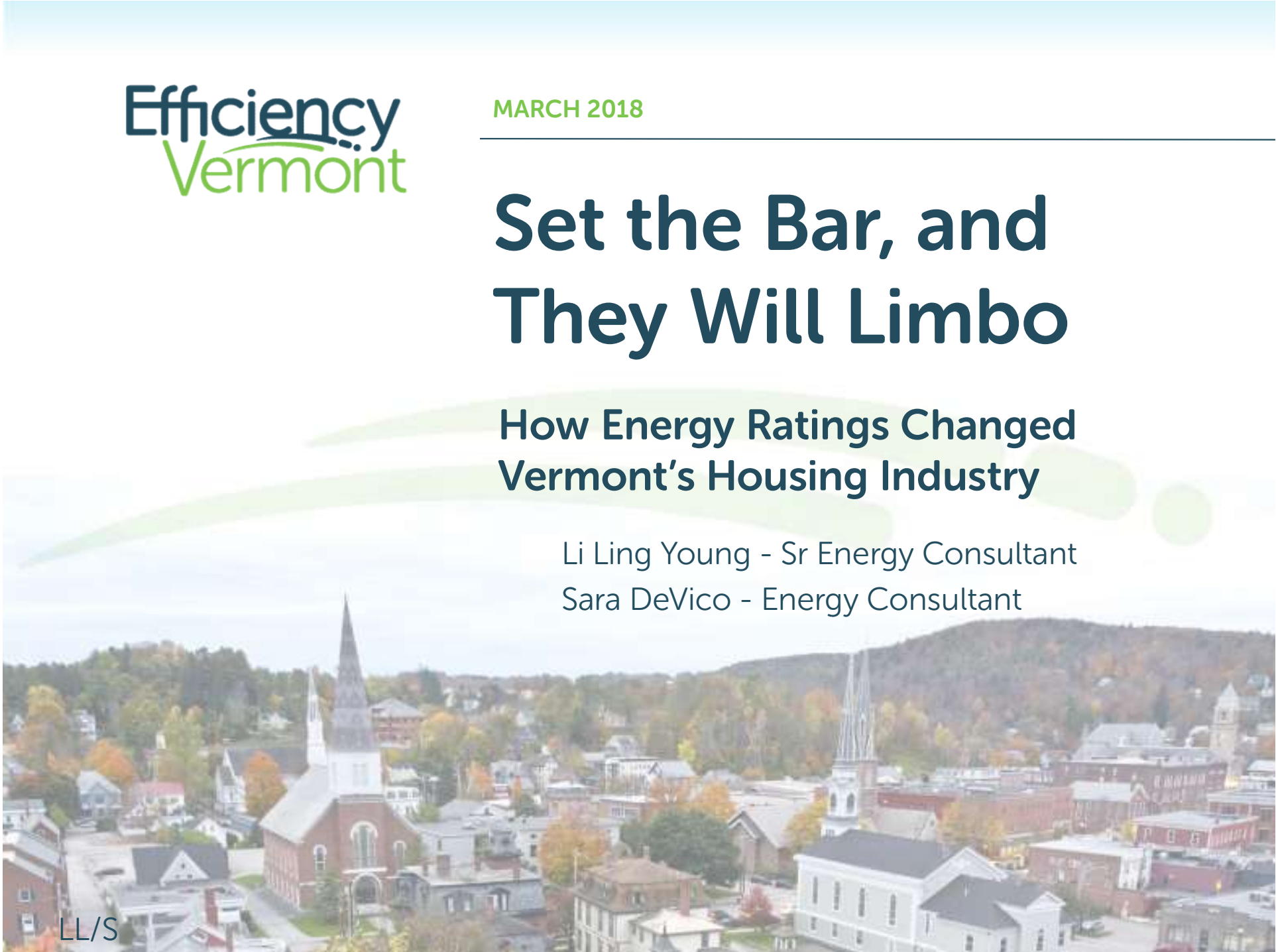


Set the Bar, and They Will Limbo

How Energy Ratings Changed Vermont's Housing Industry

Li Ling Young - Sr Energy Consultant
Sara DeVico - Energy Consultant



Welcome to Vermont:

Cold

Small

Rural

Modest

Ambitious

Unregulated

(Beautiful!)



Vermont has a plan

Comprehensive Energy Plan

- 30% of new buildings built to net-zero design standards by 2020
- ...and 100% by 2030

(Not on track, but working on it)

Efficiency Vermont

- Nation's first *Efficiency Utility* (2000)
- Serve *every* ratepayer
 - Includes snowmaking, cheese caves, municipal lighting, high performance homes
- No-cost engineering services
- Negative load growth
- Participation in Forward Capacity Market

Introducing Efficiency Vermont's High Performance Home

High Performance Homes



LL

Efficiency
Vermont


High Performance Home Specifications

Building Component	Specification
Slab	R-30
Below-grade Wall	R-30
Floor	R-40
Ceiling	R-60
Walls	R-40
Windows	U-0.21 or less
Air Leakage	1 ACH50
Ventilation	HRV or ERV (qualifying)

In the beginning...

Energy Rated Homes of Vermont

- Part of Energy Rated Homes of America
 - Introduced Star ratings for homes
- First Energy Rating – 1987
- Energy Efficient Mortgages (EEMs)
 - HERS became compliance path
- Affordable + efficient



Home Energy Rating Certificate
115 Four Sisters Road
South Burlington, VT 05403

4 Stars Plus
Verified Condition

See improvement recommendations on the reverse side

Rating number : 1006069VGS1
Certified Energy Rater: ERH
Date: July 5, 2001
Rating Ordered For:
Sheppard Construction
Conditioned Area: 4890 sq. ft.
Conditioned Volume: 34504 cu. ft.
Bedrooms: 4
House Type: Two story
Foundation: conditioned basement

Uniform Energy Rating System

1 Star	1 Star Plus	2 Stars	2 Stars Plus	3 Stars	3 Stars Plus	4 Stars	4 Stars Plus	5 Stars	5 Stars Plus
0-19	20-39	40-49	50-59	60-69	70-79	80-82	83-85	86-91	92-100

Energy Rating Points: **84.9**

This home meets the minimum criteria for the following programs:

ERH Space Heat Guarantee VT Residential Energy Code (if checked)

Mechanical Systems Features

Heating System Efficiency: 93.0 AFUE, Nat. Gas; Forced Air Furnace; Programmable thermostat
Cooling System Efficiency: No central system
Domestic Hot Water Efficiency: EF-64%; Nat. Gas; Stand-Alone Water Heater
Ventilation System: 20 Watts, Exhaust Only, Passive Inlets, 24 hour Timer

Building Shell Features (Nominal values)

Ceiling Flat: R-38	Exposed Floor: R-30
Ceiling Slope: NA	Window Type: U .40 SHGC .40
Above Grade Walls: R-19	Infiltration
Foundation: R-11	Air Changes / Hour: 0.25
Slab: R-0	Method: Tested

Lights and Appliance Features

Interior Incandescent Fixtures Qty. 27	Clothes Dryer Fuel: Nat. Gas
Interior Energy Efficient Fixtures Qty. 1	Range / Oven Fuel: Nat. Gas
Exterior Incandescent Fixtures Qty. 5	Refrigerator Efficiency: Average
Exterior Energy Efficient Fixtures Qty. 0	

Table 1 - Estimated Annual Energy Cost
Verified Condition

Use	MMBTU	Cost	Percent
Heating	112.7	\$650	39 %
Cooling	0.0	\$0	0 %
Hot Water	27.3	\$160	9 %
Lights / Appliances		\$660	39 %
Service Charges		\$210	13 %
Total		\$1680	100 %

ERHVT
Energy Rated Homes
of Vermont

255 South Champlain St.
Burlington, VT 05401
802-865-3926
802-658-1643-Fax

REMRate 8.43 HERC HERC4_sv WK4
6069v.HER; Run # 2995

Energy Ratings for DSM

PROGRAM	DESC	Years offered	# of Jobs
ASIS	1997 ASIS	96-00	50
CUTS	CUC TOS	97-98	6
CVP1	TOS CVPS	95-00	45
CVPS	CVPS RNC	95-97	335
EIMS	Energy Mo	98-01	127
FHA	1996 - FHA	1996	1
GMP	GMP RNC	95-96	56
MKT	PRE-1996	95-96	4
PSEG	PSEG RNC	1997	5
RNC	PBL	96-00	95
RNCM	RNC - MEM	1996	2
RNCU	PBC	97-02	1127
VEC	VT Elec. Co	96-99	103
VGRX	VGS Rx	1998	92
VGS1	VGS	96-02	1275
VTS	VEC TOS	1997	3
WEC	New Home	94-02	602
YESS	YESS Progr	96-00	24

- ERH providing service for \$350
- Utility incentive tied to score
 - Higher score = higher incentive
 - Extra incentives for lighting and ventilation
- Required 4 Stars Plus
- Each utility was a little different

1997

- Vermont Star Homes Program
 - 6 utility sponsors
- First State Energy Code adopted

Fast-Track Method The simplest approach. Allows you to incorporate a prescribed set of features. Minimal calculations. (See Chapter 3.)

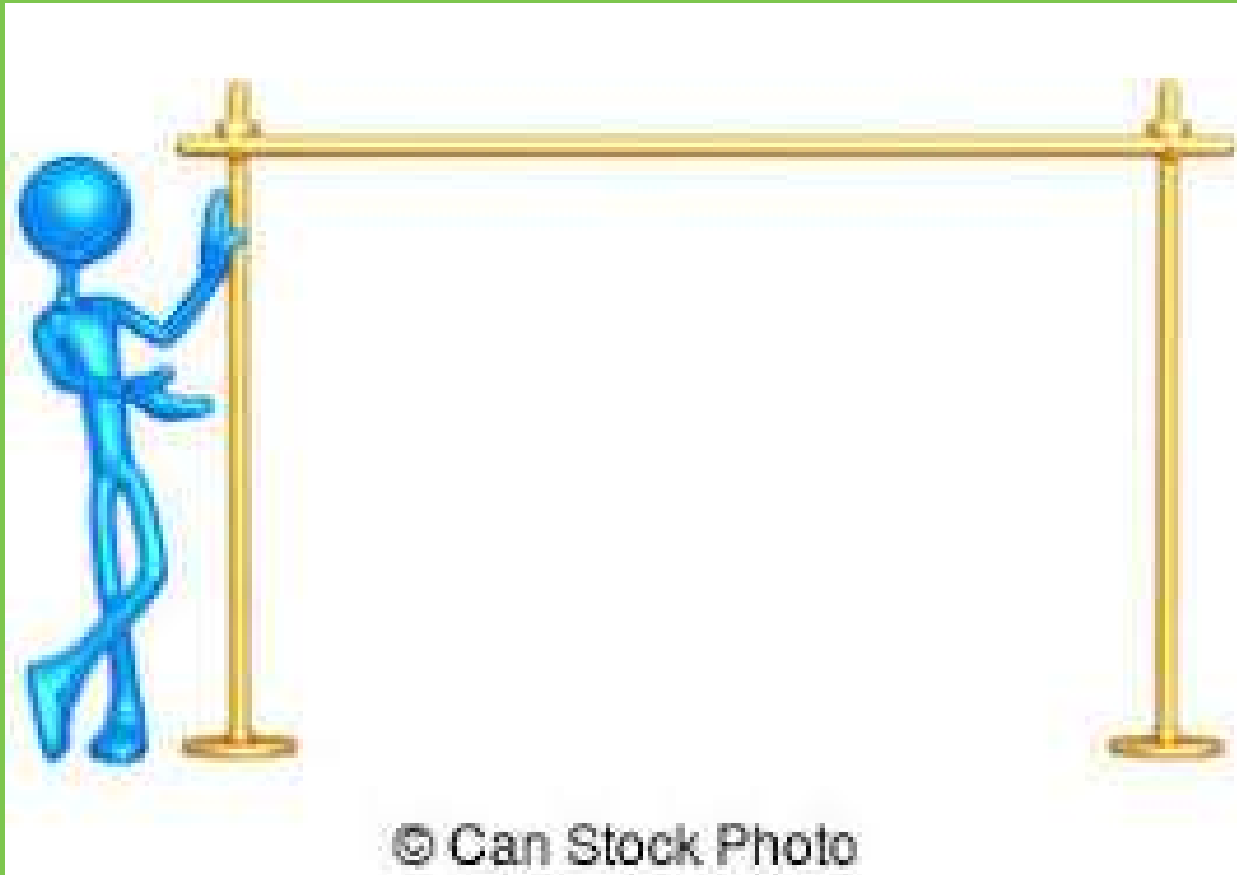
Trade-Off Method Almost as simple as the Fast-Track method, but accommodates more designs. You “trade off” various Fast-Track requirements for other features in your design. (See Chapter 4.)

VTcheck Software Method Use your computer with VTcheck software to easily analyze almost any design and determine whether any modifications are needed to meet the Code. (See Chapter 5.)

Home Energy Rating Method Achieve a minimum score of 82 (the high end of a 4 Star rating) to comply. This approach gives full credit for air tightness and solar orientation. (See Chapter 6.)

Systems Analysis Method Hire an architect or engineer to perform a state-approved systems analysis, which can accommodate any design. (See Chapter 6.)

Efficiency Vermont - 2000



Everyone Gets Access

- All services become uniform across the state
 - Moving into areas with little exposure to programs or codes
- Started with programs already in place
 - Including residential new construction

(Subsequently, have built programs for most energy end uses from swimming pools to dairy barns)

First Statewide RNC Program

Required:

- \$250 fee
- 4 Stars Plus
- Ventilation
- Combustion safety

Incentives:

- \$350
- Heating guarantee
- Savings estimates
- Code compliance assistance

* Also had a program that didn't require an Energy Rating, but it did require code compliance





Home Energy Rating Certificate

Orchard Rd.
E. Burke, VT 05832

3 Stars Plus

Current Condition

Rating number : **1003745YESS**

Certified Energy Rater: Richard Faesy

Date: 9/22/98

Rating Ordered For:

John & Jane Doe

Conditioned Area: 1232 sq. ft.

Conditioned Volume: 8378 cu. ft.

Bedrooms: 3

House Type: One and a half story Cape

Uniform Energy Rating System

1 Star	1 Star Plus	2 Stars	2 Stars Plus
0-19	20-39	40-49	50-59

En

This home

Mechanical Systems Features

Heating System Efficiency:

Cooling System Efficiency:

Domestic Hot Water Efficiency:

Ventilation System:

Building Shell Features

Ceiling Flat:

Ceiling Slope:

Above Grade Walls:

Foundation:

Slab:

Lights and Appliance Features

Interior Incandescent Fixtures

Interior Energy Efficient Fixtures

Exterior Incandescent Fixtures

Exterior Energy Efficient Fixtures

Recommendations for Energy Improvement Upgrade # 1

If all of the measures below are implemented, the home will qualify for the Energy Rating and the programs shown on the right.					
#	Measure Description	Measure Cost	Annual Energy Savings	Annual Mortgage /Loan Increase [1]	Net Annual Savings
1	Air seal cantilevered 2nd floor area, install Panasonic fan/24-hour timer	\$405	\$30	\$31	\$-1
2	Install an indirect-fired hot water storage tank as a zone off the oil boiler	\$1200	\$350	\$91	\$259
3	Install new 85%+ oil boiler such as System 2000 & additional heating zone	\$3600	\$560	\$274	\$286
4		\$0	\$0	\$0	\$0
5		\$0	\$0	\$0	\$0
6		\$0	\$0	\$0	\$0
7		\$0	\$0	\$0	\$0
8		\$0	\$0	\$0	\$0
9		\$0	\$0	\$0	\$0
10		\$0	\$0	\$0	\$0
11		\$0	\$0	\$0	\$0
12		\$0	\$0	\$0	\$0
13		\$0	\$0	\$0	\$0
14		\$0	\$0	\$0	\$0
15		\$0	\$0	\$0	\$0
Total		\$5205	\$940	\$396	\$544

Health, Safety, and Comfort, and House Durability Recommendations

- A Install a carbon monoxide detector near the fireplace
- B Install screw-in compact fluorescent light bulbs in high use locations
- C Insulate basement walls to at least R-10 (doing so will result in 4 Star Energy Rating)
- D Choose a propane dryer when it comes time to purchase one

[1] Interest Rate = 6.45% ; Term = 30 years

All procedures used for this rating are in compliance with national Home Energy Rating standards. All entries made here represent the best professional judgement as to the energy features which were identified during a site inspection or represented from plans and specifications provided to Energy Rated Homes of Vermont (ERHVT). This form nor any entries made on it constitute any warranty without the accompanying document entitled "ERH Space Heat Warranty". Further, ERHVT makes no warranties, expressed or implied, of any kind to anyone with respect to indoor air quality or radon concerns.

The rating is based on the energy efficiency of the building structure itself, and not the occupants. Actual energy usage will vary depending upon the number of occupants and their lifestyles. The rating assumes the average occupancy, weather, an average interior winter thermostat settings, and typical use for domestic hot water, lights and appliances. There has been no attempt to estimate all the electrical loads in the home. Electrical consumption is based on averages for homes of similar size. Energy costs are based on local energy prices.

1003745YESS

Orchard Rd.
E. Burke, VT 05832
9/22/98

Upgraded Energy Rating:

Stars Points
3 Stars Plus 79.3

Estimated Annual Cost Comparison

	Before	After	Savings
Total	\$2,040	\$1,496	\$544

After the upgrade, this home meets the minimum criteria for the following programs (if checked):

YESS Mortgage

2001 Snapshot

# Projects	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
46	2636	4.42	Not Available

Refining the Program (2003-2005)

- No-Rating path drops out
- Ratings get folded into a “free” program
- Cash incentive, plus bonus for appliances
- 2005 Code requires ventilation/comb. safety
- Opportunity to introduce building science issues
- ENERGY STAR compliance included
- 2005 Tax Credit

2005 Snapshot

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2001	46	2636	4.42	NA
2005	539	2817	3.28	87

The Big Upheaval - 2006

...and Homes on the Road to
Rapid improvement



S

Score

100 = Net Zero Energy Home

90 = 5 Star Plus Home

86 = 5 Star Home & ENERGY STAR®

84 = 4 Star Plus Home

82 = VT Energy Code Compliance

80 = **RESNET**
Reference Home based on older Code version

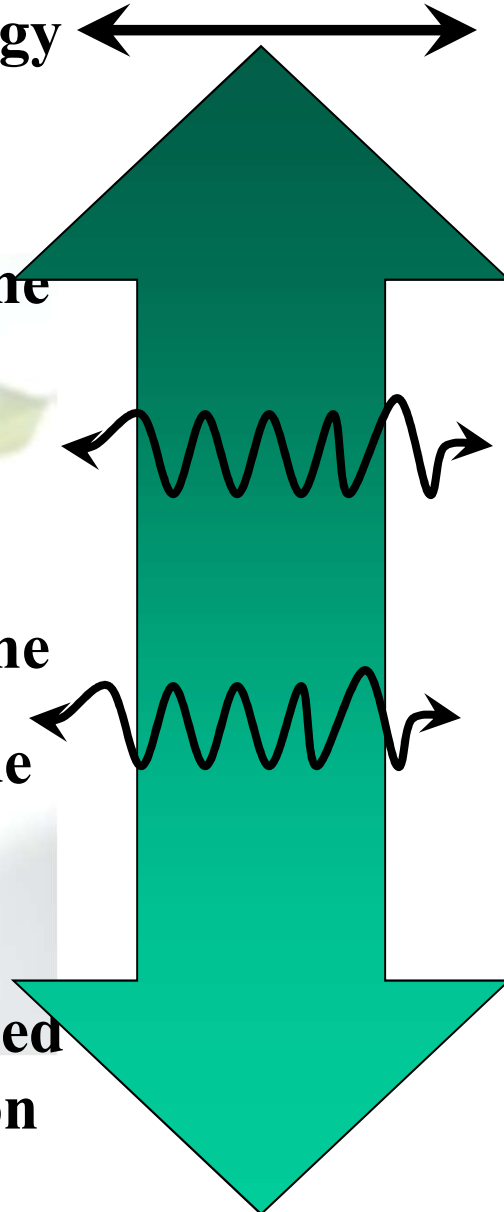
Index

0 = Net Zero Energy Home

80 = ENERGY STAR®

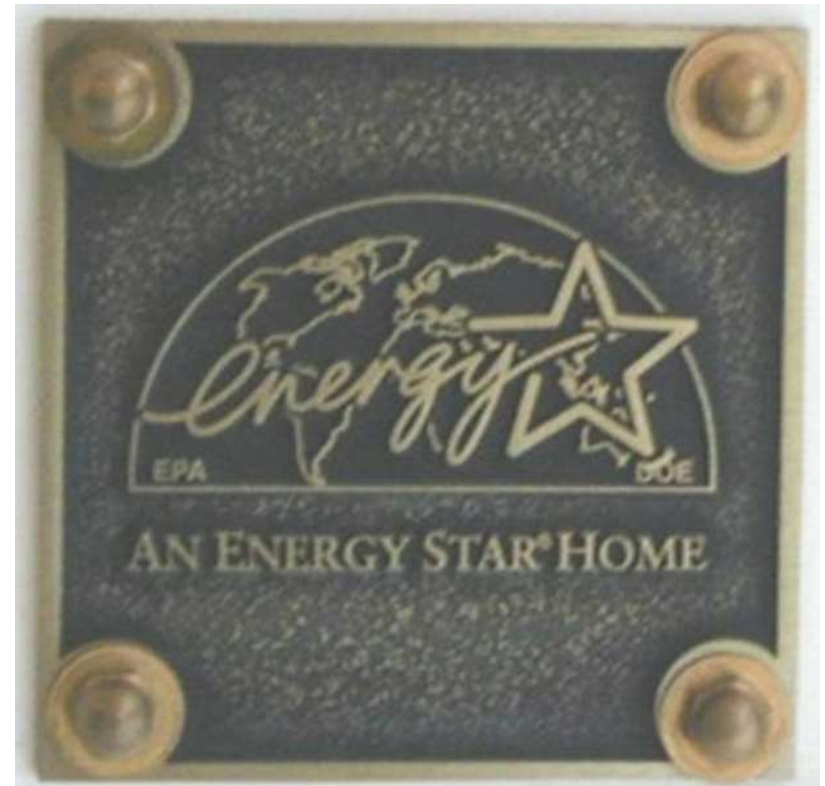
? = VT Energy Code Compliance score - to be determined.

100 = **RESNET**
Reference Home based on newer IECC Code



ENERGY STAR v2

- Thermal Bypass Inspection
 - Checklist
- Duct Leakage Limit (testing required by RESNET)
- < 80 points (climate zone 6)
- ENERGY STAR products





Program Criteria - 2006

Required:

- ENERGY STAR v2
- Four efficient light fixtures
- ENERGY STAR heating
- Mechanical ventilation*
- Combustion safety*

*Now required by energy code

Incentive:

- A la carte
- ENERGY STAR verification
- 2005 EPACT verification
- Heating guarantee
- Code compliance

2008 Snapshot

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2001	46	2636	4.42	NA
2005	539	2817	3.28	87
2006	540	2755	3.73	78
2007	557	2614	4.15	65
2008	411 (38.8% market share)	1318	3.64 (Non-program 5.3)	61

Refining the Program 2008-2011

- 3 ACH50 program requirement
- Increased incentive (>\$1000)
- Ratings for code compliance take off 2011

2011 Snapshot

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2001	46	2636	4.42	NA
2005	539	2817	3.28	87
2006	540	2755	3.73	78
2007	557	2614	4.15	65
2008	411 <i>(38.8% market share)</i>	1318	3.64 <i>(Non-program 5.3)</i>	61
2011	327 <i>(40.2% market share)</i>	2335	2.46 <i>(Non-program 3.6)</i>	56

ENERGY STAR v3

...everything breaks

Program Criteria - 2012

Required:

- Prescriptive insulation levels; 3 ACH50
- Option to not meet ESv3 – 4 ACH50
- ENERGY STAR HVAC and appliances
- 50% efficient lighting

Incentive:

- \$500 base

2012 Snapshot

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2001	46	2636	4.42	NA
2005	539	2817	3.28	87
2006	540	2755	3.73	78
2007	557	2614	4.15	65
2008	411 <i>(38.8% market share)</i>	1318	3.64 <i>(Non-program 5.3)</i>	61
2011	327 <i>(40.2% market share)</i>	2335	2.46 <i>(Non-program 3.6)</i>	56
2012	284	2175	2.37	54

Program Criteria 2013-2015

Required:

- Tiers
 - Gold: 1 ACH50
 - Silver: 3 ACH50
 - Bronze: 4 ACH50
- Prescriptive insulation (≈IECC 2009)
- 80% efficient lighting

Incentive:

- Based on HERS index
 - \$40+/point-below-60 (up to \$1500)
- \$200 Tier II appliance bonus

2013: High Performance Homes "Gold Tier"

- R-30 slab (later relaxed)
- R-30 foundation walls
- R-40 walls
- R-60 ceiling
- U .19 windows (later changed to U .21)
- 1 ACH50
- Balanced ventilation (qualifying: later relaxed)

2013 Snapshot: HPH projects

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2013 overall	327	2010	2.17	53
2013 HPH tier	7	2149	0.57	34

Program Criteria 2016

Requirement:

- Prescriptive insulation
- 80% efficient lighting
- Windows U 0.28
- < 3ACH50

Incentive:

- \$500 base incentive
- \$600 continuous wall insulation incentive
- \$2000 High Performance Home
- Free ENERGY STAR verification

2016 Snapshot: HPH projects

Year	# Projects (Avg.)	CFA (Avg.)	ACH50 (Avg.)	HERS (Avg.)
2016 overall	389	2132	1.65	49
2013 HPH	7	2149	0.57	34
2015 HPH	19	1719	0.55	35
2016 HPH	51 10.8% of program	1812	0.57	38

Program Criteria 2017

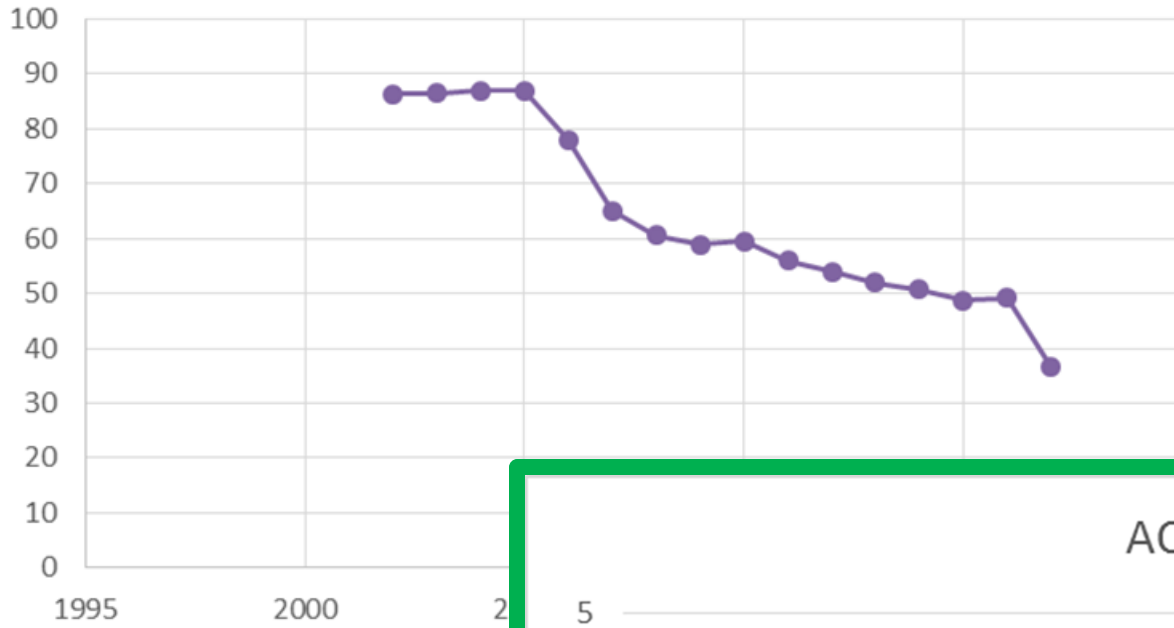
Requirements:

- No-Rating option – bigger incentive
- Prescriptive insulation
- 80% efficient lighting
- ENERGY STAR appliances, heating+cooling
- < 3ACH50

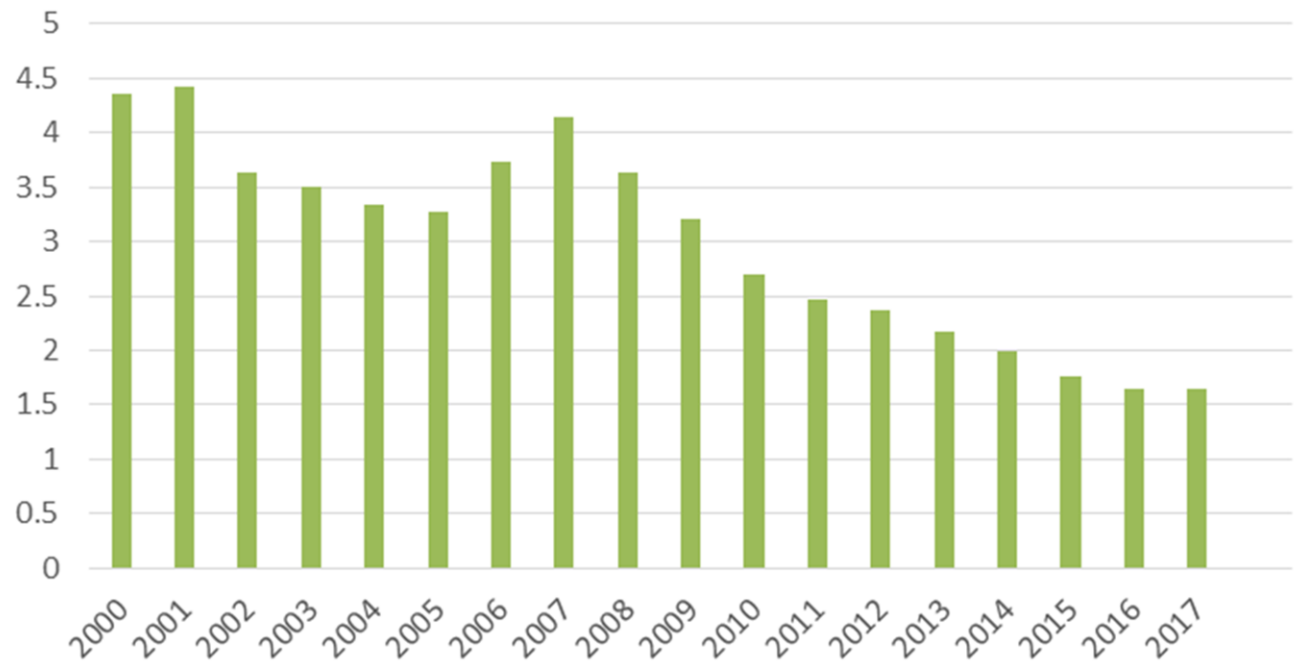
Incentive:

- \$400 incentive (\$800 without Energy Rating)
- \$800 Comfort bonus
 - Continuous wall insulation
 - Qualifying HRV
 - < 2ACH50
- Green Addendum (for HPH)

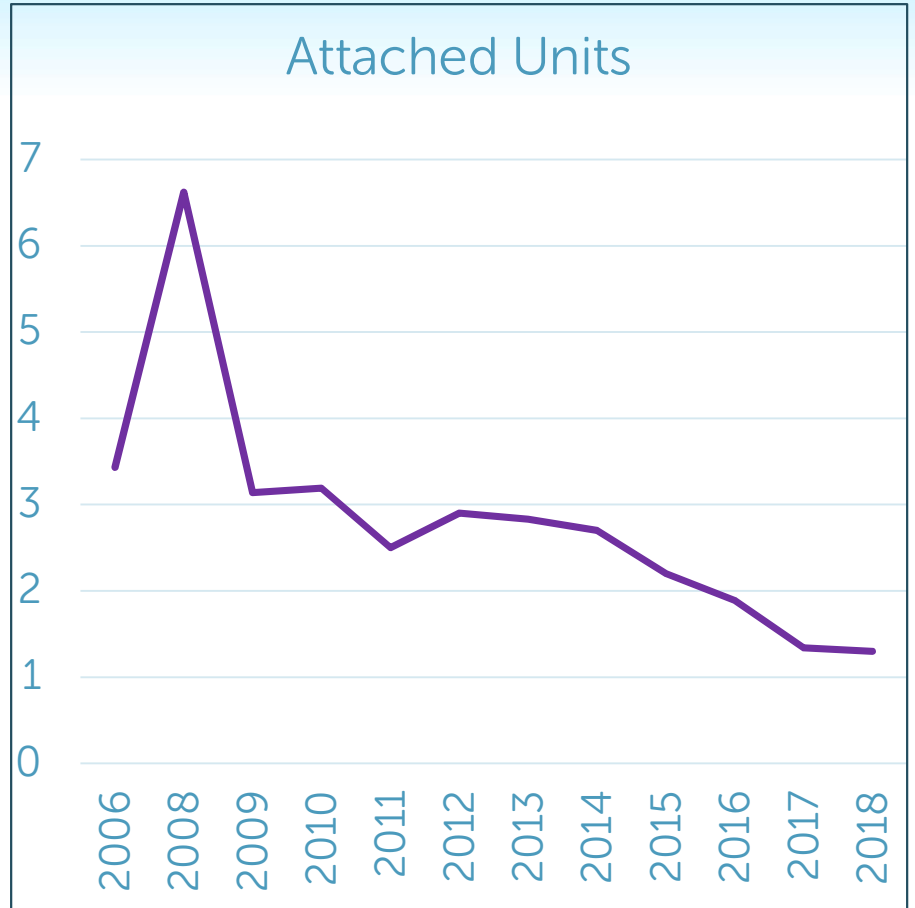
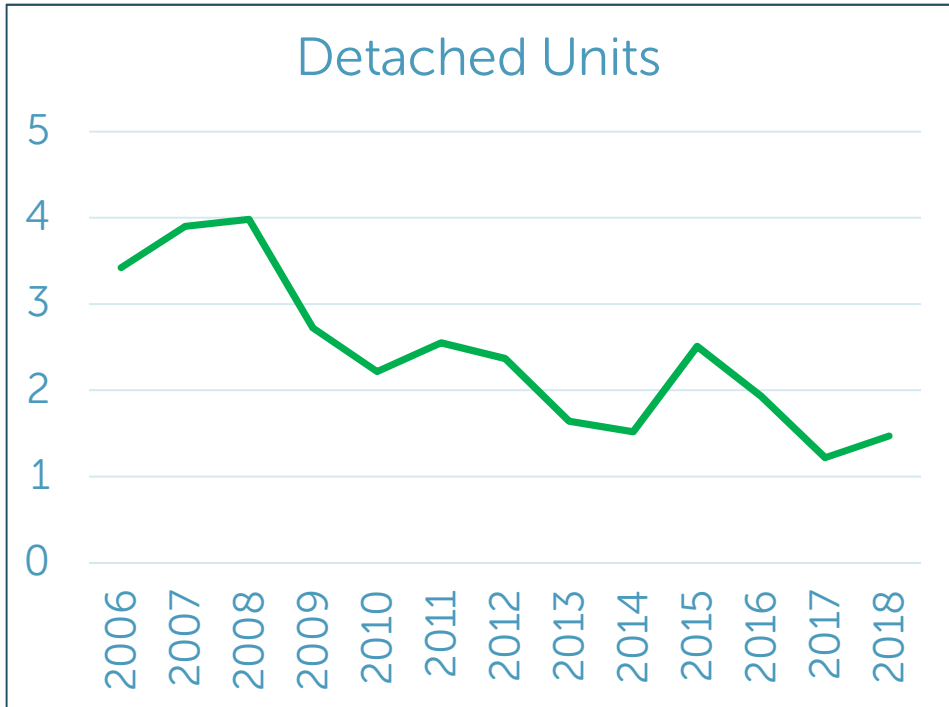
HERS w/o Renewables



ACH50



Case Study







©2017

S

Efficiency
Vermont

Requirements	EVT Certified (2017)	EVT Certified v2 (2018)
Wall insulation (above-grade and band joist)	R-20	Min R-5 continuous; total min R-26
Insulation installation	Grade II	Grade I
Air leakage, max ACH50	3.0	2.0
Ventilation	Code-compliant	High-efficiency balanced ventilation
Water heating equipment	Federal minimum	ENERGY STAR or equivalent
Lighting	80% ENERGY STAR	95% ENERGY STAR
Bathroom water fixtures	n/a	2/3 of toilets, shower(s) and bath sink faucets are WaterSense <u>or flow equivalent</u>
INCENTIVE	\$400-800	\$2500

2018

	EVT: Certified 2.0	EVT: HPH 2.0
Foundation wall	R-15 cont. / R-20 cavity	R-30
Slab edge	R-15	R-30, slab on grade R-20, slab below grade Footing \geq R-8
Under slab	R-15 (heated slab only)	R-20, unheated below grade R-30 heated or unheated on grade
Ceiling	R-49 sloped / R-60 flat	R-60
Above grade wall	Min R-5 cont / R-26 total	R-40
Air leakage	Test to \leq 2 ACH50	Test to \leq 1 ACH50
Windows (max)	U-0.28	U-0.21
Heat/cool/appliances	ENERGY STAR	
Ventilation	High efficiency balanced system	
Water	ENERGY STAR, plus 2/3 of non-filling fixtures are low flow	
Incentive	\$2500	\$3000

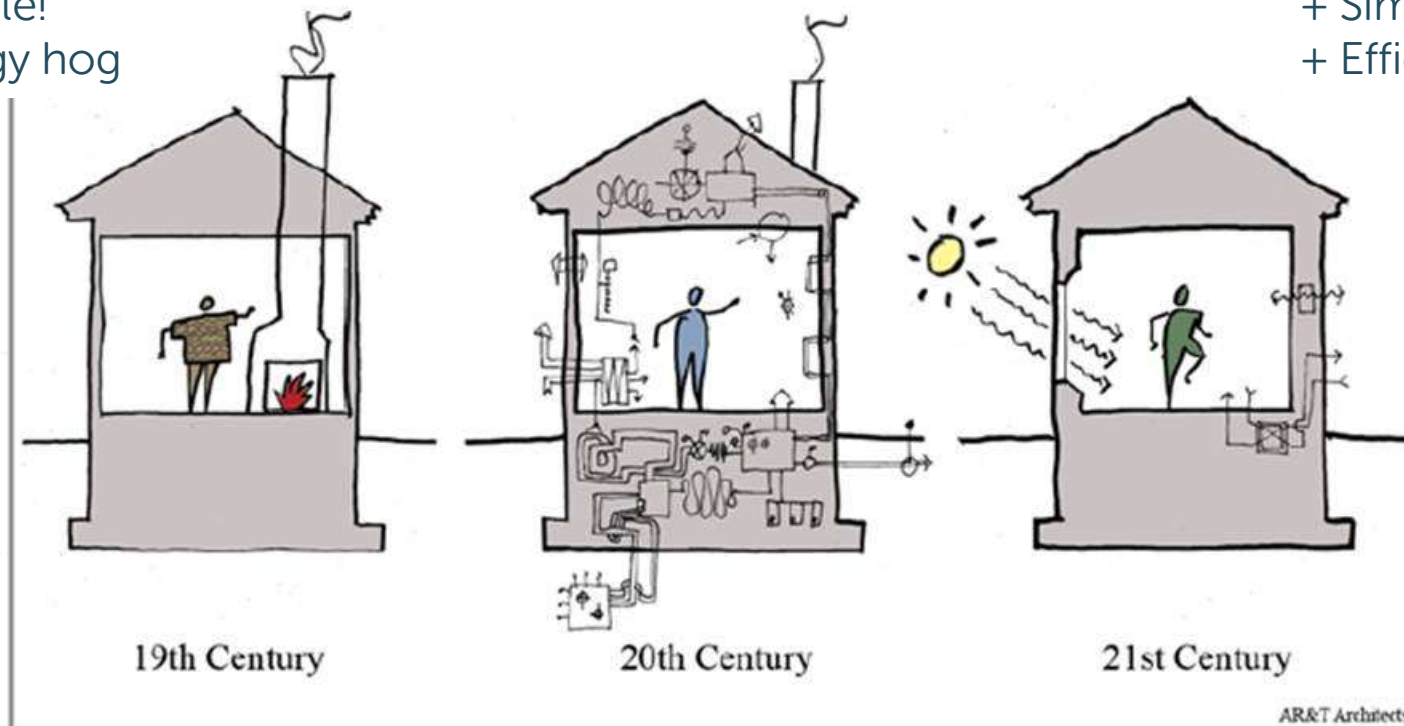
HPH– What is it?

HPH aim: smarter, simpler

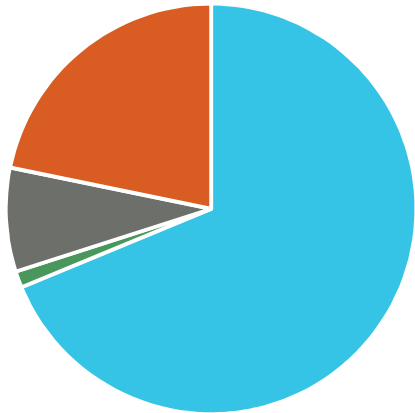
- Uncomfortable
- + Simple!
- Energy hog

- + Comfortable
- Complex
- Energy hog

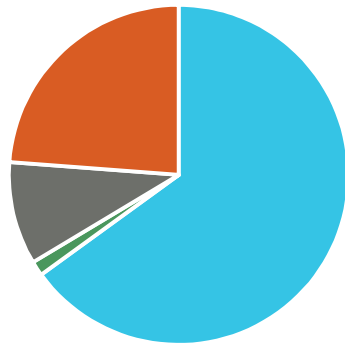
- + Comfortable
- + Simple
- + Efficient



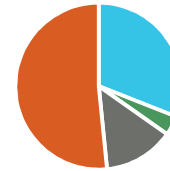
VT Baseline 2011



VT Baseline 2015

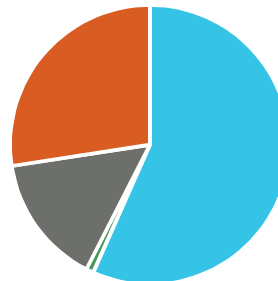


High Performance Homes

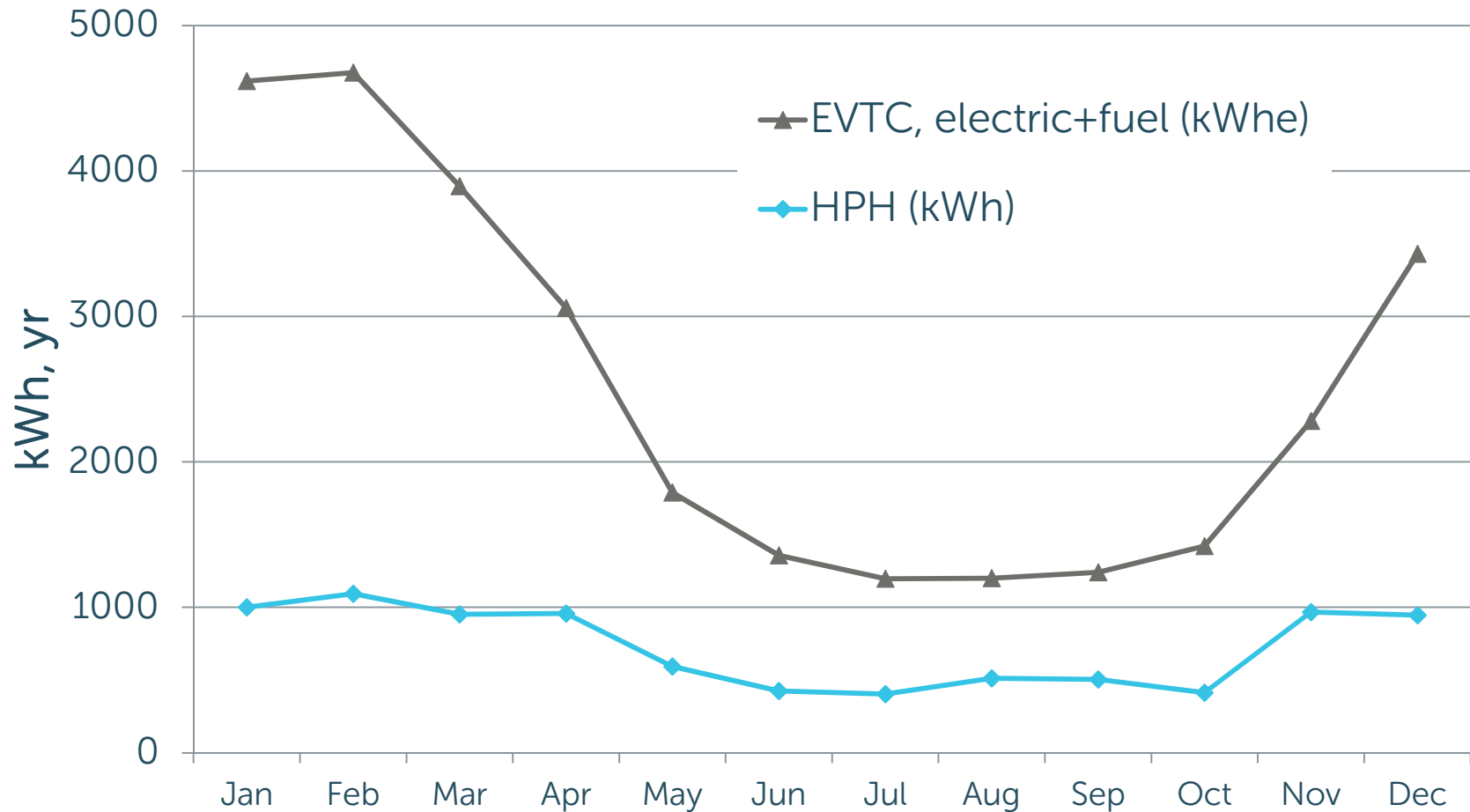


- Heating
- Hot Water
- Cooling
- Lights & Appliances

RNC Program



Comparing the High Performance Home



S

2015 monthly electricity consumption, HPH (n=10, avg. HERS=36) vs. EVTC (n=531, avg. HERS=52). HPH data includes homes with min. 1 year of data; net-metered homes excluded.

High-R walls



Well-detailed air sealing



Foundation

- R-30 at slab edge
- R-20 under slab and below-grade walls



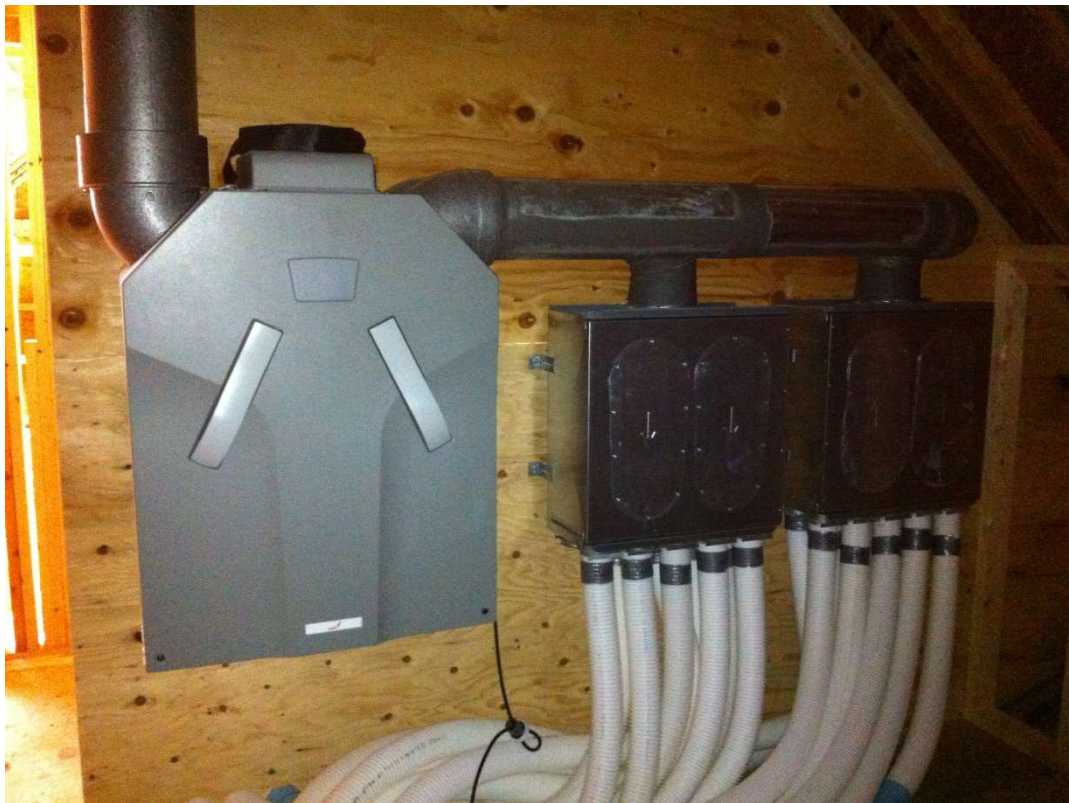
Windows

U-0.21 or better

Usually triple-pane,
insulated frame, casement



Balanced ventilation



Whole house
distribution with
heat recovery

Efficient appliances and lighting



- LEDs
- Heat pump clothes dryer
- Tier III appliances
- Heat pump water heater

Some examples in Vermont





HIGH PERFORMANCE MODULAR HOMES
ZERO ENERGY READY FOR THE 21st CENTURY



Efficiency
Vermont

Owners Love their High Performance Homes

"Perfectly comfortable all the time."

Multiple Benefits:

- Energy savings + low maintenance
- **Comfort**
- Good daylighting
- **Resiliency**
- Fossil fuel-free

"Why wouldn't you build this way?"

**It's not all about building
details....**

Tools

Advanced Air Sealing

Ensure comfort & moisture protection

Efficiency
Vermont

Residential
New Construction
Guidance

Balanced Ventilation

Improve air quality and health

Efficiency
Vermont

Residential
New Construction
Guidance

Continuous Insulation

Eliminate heat loss from wood studs

Efficiency
Vermont

Residential
New Construction
Guidance

Why air

As air tightne
and goals ha
stringent—2.
below—built
need to ince
sealing detai
The Vermon
Code air sea
a great starti

Why ba ventilat

Exhaust-or
(the “bath f
air from a h
in fresh air.
house and
through op
building en
fresh air ge
as bedroom

Why continuous insulation matters

Insulation makes a home more comfortable and less expensive to heat, but most homes in Vermont only have insulation between the studs. A typical wall with studs spaced 16” apart ends up being around 25% wood (studs) and 75% insulation. On a cold winter day, a wall without continuous insulation can have an interior surface temperature 15-20 degrees cooler

Wood conducts energy more readily than insulation. A sensitive thermal imaging camera “shows” heat loss due to these studs. In the image at below, yellow areas indicate heat loss (as well as fuel/money loss). There is a way to reduce this!

Applying a layer of insulation on the outside (most typical) or inside of the stud wall essentially forms a continuous blanket (also known as a “thermal break”) around the home. This leads to greater comfort, warmer walls, and reduced heat loss and air leakage. Plus, it’s a great way to reduce sound transmission through walls.



Efficiency Excellence Network

- Opportunity for qualified builders to differentiate themselves
- Access to marketing materials and upgraded website listings
- Access to networking events and trainings
- Preferred listing on Efficiency Vermont website





Education Opportunities

- Better Buildings by Design
 - 1000+ attendance every year
- High Performance Homes summits
 - Design, construction, operation issues
 - Advanced-level topics only
- Speakers Bureau
 - Presentations for towns, businesses, large employers, faith groups, credit unions, etc.
- Technical trainings through EEN

Green Addendum

- 7 pages, provided to appraiser
- Developed by Appraisal Institute
- Energy consultant fills out with projected (or completed) project data

 <p>Form 820.04*</p>	Client File #:	Appraisal File #:
	<h2>Residential Green and Energy Efficient Addendum</h2>	
Client:		
Subject Property:		
ENERGY EFFICIENT ITEMS The following items are considered within the appraised value of the subject property:		
The appraiser hereby • has been considered in the appraisal • is not provided	Insulation <input type="checkbox"/> Fiberglass Blown-In <input type="checkbox"/> Foam Insulation <input type="checkbox"/> Cellulose <input type="checkbox"/> Fiberglass Batt Insulation <input type="checkbox"/> Other (Describe): Home is built on a frost protected foundation and home's floor is insulated to R-40. <input checked="" type="checkbox"/> Basement Insulation (Describe): <input checked="" type="checkbox"/> HERS Insulation Installed Rating: <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 (See Glossary)	R-Value: <input checked="" type="checkbox"/> Walls 43 <input checked="" type="checkbox"/> Ceiling 60 <input checked="" type="checkbox"/> Floor 40
	Envelope Envelope Tightness: 79CFM50; .62ACH50 Unit: <input type="checkbox"/> CFM25 <input type="checkbox"/> CFM50 <input type="checkbox"/> ACH50 <input type="checkbox"/> ACHnatural <input checked="" type="checkbox"/> Envelope Tightness based on Blower Door Test	
Water Efficiency <input type="checkbox"/> Reclaimed Water System (Explain): <input type="checkbox"/> Greywater reuse system <input checked="" type="checkbox"/> WaterSense® fixtures <input type="checkbox"/> Rain Barrels Provide Irrigation	Location of cistern: <input type="checkbox"/> Cistern - Size: Gallons	

 <p>Form 820.05*</p>	Client File #:	Appraisal File #:
	<h2>Residential Green and Energy Efficient Addendum</h2>	
Client:		
Subject Property:		
City: State: Zip:		
Additional resources to aid in the valuation of green properties and the completion of this form can be found at http://www.appraisalinstitute.org/education/green_energy_addendum.aspx		
The appraiser hereby certifies that the information provided within this addendum: • has been considered in the appraiser's development of the appraisal of the subject property only for the client and intended user(s) identified in the appraisal report and only for the intended use stated in the report. • is not provided by the appraiser for any other purpose and should not be relied upon by parties other than those identified by the appraiser as the client or intended user(s) in the report. • is the result of the appraiser's routine inspection of and inquiries about the subject property's green and energy efficient features. Extraordinary assumption: Data provided herein is assumed to be accurate and if found to be in error could alter the appraiser's opinions or conclusions. • is not made as a representation or as a warranty as to the efficiency, quality, function, operability, reliability or cost savings of the reported items or of the subject property in general, and this addendum should not be relied upon for such assessments.		
Green Building: The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classic building design concerns of economy, utility, durability, and comfort (US EPA). High Performance building and green building are often used interchangeably.		
Six Elements of Green Building: A green building has attributes that fall into the six elements of green building known as (1) site, (2) water, (3) energy, (4) materials, (5) indoor environmental quality, and (6) maintenance and operation. The energy and water elements are the most measurable elements of green or high performance housing. Appraisers need savings amounts to develop an income approach to support energy efficient contributory value.		
THIRD-PARTY VERIFICATIONS (See types defined in glossary) The following verified items are considered within the appraisal analysis of the subject property:		
Green Certification Environmental Protection Agency (EPA): <input type="checkbox"/> Indoor airPLUS <input type="checkbox"/> WaterSense <input type="checkbox"/> ENERGY STAR Energy Department (DOE): <input type="checkbox"/> Zero Energy Ready Home (ZERH)	Home Innovation Research Labs (HIRL) Home Remodel: <input type="checkbox"/> Bronze <input type="checkbox"/> Silver <input type="checkbox"/> Gold <input type="checkbox"/> Emerald Home Innovation Research Labs (HIRL) New Home: <input type="checkbox"/> Living Building Certified <input type="checkbox"/> Petal Certification Living Building Challenge (LBC): <input type="checkbox"/> PHI Low Energy <input type="checkbox"/> EnerPHit <input type="checkbox"/> Passive House Passivhaus Standard: <input type="checkbox"/> PHIUS+ 2015 Passive House Institute US: <input type="checkbox"/> USGBC LEED: <input type="checkbox"/> Certified <input type="checkbox"/> Silver <input type="checkbox"/> Gold <input type="checkbox"/> Platinum	ABOVE VAULT ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input type="checkbox"/> Verification attached to this report
Energy Label Labels disclose the size of the home's energy assets. RESNET's HERS Rating (0 to 150): <input type="checkbox"/> Sampling Rating <input type="checkbox"/> Projected Rating <input checked="" type="checkbox"/> Confirmed Rating DOE's Home Energy Score: <input type="checkbox"/> Official Score <input type="checkbox"/> Unofficial Score Other Energy Score: Range (_____ to _____):	Estimated energy savings for this home: \$ _____ /year _____ kWh rate dated ____/____/____ Energy Savings includes electricity, heating & cooling. Score below 100 indicates energy costs are expected to be lower than average local code home per square foot. HERS Index Report estimates energy cost based on number of bedrooms plus one. Only a "Confirmed Rating" is a diagnostic test. Estimated energy savings for this home: \$ _____ /year _____ kWh rate dated ____/____/____ Energy Savings includes electricity, heating & cooling. Score (1 to 10): Score above five indicates energy costs are expected to be lower than average local home. Home Energy Score estimates energy cost based on state average energy rates and the home's energy features. Estimated energy savings: \$ _____ /year _____ kWh rate dated ____/____/____ Describe energy label system:	ABOVE VAULT ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input type="checkbox"/> Verification attached to this report
Date Verified: ____/____/____ Organization URL: _____	Score or Rating Version: _____ <input type="checkbox"/> www.homescores.gov <input type="checkbox"/> Other: _____	ABOVE VAULT ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input type="checkbox"/> Verification attached to this report
Verified Energy Improvements Explain energy-related improvements: Cost of improvements: \$ _____	Date Verified: ____/____/____ Certificate of Efficiency Improvements Version: _____ Organization URL: <input type="checkbox"/> Other: _____ <input type="checkbox"/> energystar.gov/homeperformance	ABOVE VAULT ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input type="checkbox"/> Verification attached to this report
Completed by: _____ Title: _____ Date: _____		

*NOTICE: The Appraisal Institute publishes this form for use by appraisers where the appraiser deems use of the form appropriate. Depending on the assignment, the appraiser may need to provide additional data, analysis and work product not called for in this form. The Appraisal Institute makes no representations, warranties or guarantees as to, and assumes no responsibility for, the data, analysis or work product, or third party certifications, verifications, data specifications, scores, indices, or evaluation tools, used or provided by the individual appraiser(s) or others in the specific contents of the AI Reports®. AI Reports® AI-820.05 Residential Green and Energy Efficient Addendum © Appraisal Institute 2017, All Rights Reserved. May 2017

Energy Label Labels disclose the state of the home's energy assets.	RESNET's HERS Rating (0 to 150): _____ <input type="checkbox"/> Sampling Rating <input type="checkbox"/> Projected Rating <input type="checkbox"/> Confirmed Rating	Estimated energy savings for this home: \$ ____/year ____ ¢kWh rate dated ____/____/____ <i>Energy Savings includes electricity, heating & Cooling.</i> <i>Score below 100 indicates energy costs are expected to be lower than average code-built home. HERS Index Report occupancy estimates energy cost based on number of bedrooms plus one. Only a "confirmed rating" is diagnostically tested.</i>
	_____ _____	_____ _____

Green Certification Certifications attest that the home meets certain minimum thresholds.	Environmental Protection Agency (EPA): <input type="checkbox"/> Indoor airPLUS <input type="checkbox"/> WaterSense <input type="checkbox"/> ENERGY STAR	
	Energy Department (DOE): <input type="checkbox"/> Zero Energy Ready Home (ZERH)	
	Home Innovation Research Labs NGBS Home Remodel:	
	Home Innovation Research Labs NGBS New Home: <input type="checkbox"/> Bronze <input type="checkbox"/> Silver <input type="checkbox"/> Gold <input type="checkbox"/> Emerald	
	Living Building Challenge (LBC): <input type="checkbox"/> Living Building Certified <input type="checkbox"/> Petal Certification	
	Passivhaus Standard: <input type="checkbox"/> PHI Low Energy <input type="checkbox"/> EnerPhit <input type="checkbox"/> Passive House	
	Passive House Institute US: <input type="checkbox"/> PHIUS+ 2015	
USGBC LEED: <input type="checkbox"/> Certified <input type="checkbox"/> Silver <input type="checkbox"/> Gold <input type="checkbox"/> Platinum		
Other: _____		
Date Verified: ____/____/____	Green Certification Version: _____ Organization URL: _____	ABOVE VALID ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input type="checkbox"/> Verification attached to this report

The following items are considered within the appraisal analysis of the subject property:

Insulation	<input type="checkbox"/> Fiberglass Blown-In <input type="checkbox"/> Foam Insulation <input type="checkbox"/> Cellulose <input type="checkbox"/> Fiberglass Batt Insulation <input type="checkbox"/> R-Value ___ Wall ___ Ceiling <input type="checkbox"/> Other (Describe): _____					
Building Envelope	Envelope Tightness: _____ Unit: <input type="checkbox"/> __ CFM25 <input checked="" type="checkbox"/> __ CFM50 <input type="checkbox"/> __ ACH50 <input type="checkbox"/> __ ACH natural Instructions: Insert the rating as a number that could be 0.5 to 7ACH50 or higher. The lower the number, the more air tight the envelope. Building Codes for area show maximum Envelope Tightness allowed based on the climate zone. Not all areas have adopted a building code. http://bcap-energy.org/					
Windows	<input type="checkbox"/> ENERGY STAR®	<input type="checkbox"/> Low E	<input type="checkbox"/> High Impact	<input type="checkbox"/> Storm	<input type="checkbox"/> Double Pane <input type="checkbox"/> Triple Pane	<input type="checkbox"/> Tinted <input type="checkbox"/> Solar Shades
Day Lighting	<input type="checkbox"/> # Of Skylights: _____	<input type="checkbox"/> # Of Solar Tubes: _____	<input type="checkbox"/> Other (Describe): _____ (% Of lighting LEDs): _____			
ENERGY STAR® Appliances	ENERGY STAR®: <input type="checkbox"/> Dishwasher <input type="checkbox"/> Refrigerator <input type="checkbox"/> Washer/Dryer <input type="checkbox"/> Other: _____ Energy Source: <input type="checkbox"/> Propane <input type="checkbox"/> Electric <input type="checkbox"/> Natural Gas <input type="checkbox"/> Other: _____ Note: ENERGY STAR® appliances do not result in an ENERGY STAR® Home.					
Water Heater	<input type="checkbox"/> ENERGY STAR®	Size: _____ gallons <input type="checkbox"/> Tankless	<input type="checkbox"/> Solar (next page)	<input type="checkbox"/> Heat Pump	<input type="checkbox"/> Coil	
HVAC & Related Equipment Describe in comments area.	<input type="checkbox"/> High Efficiency HVAC SEER: _____ Efficiency Rating: _____% AFUE* _____% *Annual Fuel-Utilization Efficiency	<input type="checkbox"/> Heat Pump Efficiency Rating: _____ COP: _____ HSPF: _____ SEER: _____ EER: _____	Thermostat/Controllers? <input type="checkbox"/> Yes <input type="checkbox"/> No Programmable Thermostat? <input type="checkbox"/> Yes <input type="checkbox"/> No Auxiliary heat source? <input type="checkbox"/> Yes <input type="checkbox"/> No Radiant Floor Heat? <input type="checkbox"/> Yes <input type="checkbox"/> No Geothermal? <input type="checkbox"/> Yes <input type="checkbox"/> No Electric Vehicle Ready? (car charger) <input type="checkbox"/> Yes <input type="checkbox"/> No			
Indoor Environmental Quality	<input type="checkbox"/> Energy (ERV) or Heat Recovery Ventilator (HRV) <input type="checkbox"/> Other Measured Whole-House Ventilation Device (See glossary) <input type="checkbox"/> Humidity Monitoring Device installed			<input type="checkbox"/> Non Toxic Pest Control <input type="checkbox"/> Radon System: <input type="checkbox"/> Active <input type="checkbox"/> Passive		

The trifecta

- The **builders** can build it
- The **real estate** and **appraisal** markets are starting value it
- The **homebuyers** are starting to expect it*

Unique or universal?

- Legislation and regulation +
- Lousy with environmentalists +
- Cold climate +
- Staying power +
- Quality builders +
- Yankee frugality +

The air hurts my face



DepressedAlien.com

Why am I living where
the air hurts my face

OH

THATS WHY



Thanks!

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Efficiency
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