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March 24, 2026

RE: 25-P047 – RBES Amendments

Dear LCAR Committee,

We would like to respond to the two questions Rep. Squirrell asked of the Department of Public Service at the March 19th committee meeting from the professions' point of view:

1) Cost analysis and ROI

The 2023 cost analysis for the 2024 RBES appears to be off by a factor of ten ($1,100 versus $11,000–$15,000). This far exceeds what could be attributed to inflation since 2023.

VBRA submitted three case studies to the Governor last summer. These are typical buildings, not exceptional in any way. They were also submitted to the Department of Public Service and are attached here. All three comparisons were produced for real projects by highly regarded homebuilders, and all three compared 2024 RBES costs to 2020 costs.

In comments to the Department of Public Service, Richard Faesy of Energy Futures Group (EFG) suggested these analyses are neither independent nor sound. We would respectfully note that these case studies reflect typical real-world construction costs in Vermont today and should be considered alongside modeled projections.

Return on investment (ROI) is a more complicated calculation, but we have one builder (Jason Webster of Huntington Homes) who analyzed several elements (see below). He found a simple payback of approximately 43 years for a key element, R-5 continuous insulation.

The cost analysis submitted to LCAR (April 25, 2023, p. 4) estimated a overall payback or ROI of 8%–27% (3.7 to 12.5 years), and under three years when including the social cost of carbon. We find this hard to believe.

2) Re-adoption of 2020 RBES

Re-adopting the 2020 RBES will reduce confusion, not create it.

Homebuilders are being trained to the 2024 RBES and understand its challenges. Some builders are able to meet the 2024 requirements and certify to it. Many others can comply as much as possible but must defer to homeowner decisions regarding cost.

To remain in compliance with the law, these builders need a clear pathway to certify under the 2020 RBES when full compliance with 2024 standards is not feasible.

This reflects current reality. Legal re-adoption will reduce the angst builders are facing right now: "to certify or not to certify."

3) Timing

We respectfully urge LCAR to re-adopt the 2020 RBES at its earliest convenience.

Builders are on the edge of the spring building season and need to know what they will be building. Homeowners also need clarity on what their projects will cost.

Sincerely yours,

Jim Bradley	and	Sandra Vitzthum
Hayward Design-Build		Sandra Vitzthum Architect
Member, VBRA		Member, VBRA and AIAVT

Huntington Homes analysis – Jason Webster
Cost Analysis for R-5 Continuous Insulation (December 2025)

I recently had a HERS rating completed for one of our standard 1,900 sq. ft. two-story homes. The home was modeled two ways:

- Built to 2020 RBES
- Built to 2020 RBES with R-5 continuous insulation (no other code updates)

The 2020 RBES home uses a high-efficiency propane boiler with hot water baseboard heating.

- Annual heating cost: $1,242
- Annual propane consumption (heating): 483 gallons

With the addition of R-5 continuous insulation:

- Annual heating cost: $1,115
- Annual savings: $127

The cost of the R-5 insulation upgrade is $5,465, resulting in a simple **payback of approximately 43 years.**

While propane prices may increase over time, shortening the payback period, a 43-year payback is roughly twice the expected useful life of the mechanical system. It is reasonable to assume that newer technologies—such as air-to-water heat pumps—would be installed well before that payback is realized.

From a practical standpoint, this raises a question: why not install the most cost-effective system to operate today, rather than invest heavily in envelope upgrades with very long payback periods?

Carbon impact:
The 2020 RBES home uses approximately 483 gallons of propane annually for heating, or about 626 gallons per year including hot water. This equates to approximately 7,925 lbs of CO_2 per year—roughly equivalent to one round-trip flight to Florida for a family of four, or about one-third of the annual emissions of a beef cow.

Public Comments submission to the Department of Public Service
February 9, 2025

Cost effectiveness documentation for Vermont's adoption of the 2024 standards (RBES) was not accurate.

Updates to Vermont's energy codes must be cost effective. (30 VSA 51) According to the Department of Public Services' website, the last version to illustrate 2024 RBES' cost effectiveness was published 4/25/23: PSD website for energy code updates The document is here: PSD Final Proposed Rule Filing 4/25/23

Here are the charts from pages 16-17:

Table 1: Revised Costs and Benefits Anticipated for 2023 RBES Standard Base Code

$1,018

	Average Annual Weighted Savings	Package Costs (over 2020 RBES)	Simple Payback	ROI	Cash Flow
Standard Low Cost 2023	$83	$1,018	12.2	8%	$9
Standard Low Cost 2023 (with Social Cost of Carbon)	$127	$1,018	8.0	12%	N/A
Standard All Electric 2023	$785	$2,951	3.8	27%	$570
Standard All Electric 2023 (with Social Cost of Carbon)	$1,042	$2,951	2.8	35%	N/A
Standard Blended (81% Fossil & 19% Electric)	$216	$1,385	6.4	16%	$116
Standard Blended (81% Fossil & 19% Electric) (with Social Cost of Carbon)	$301	$1,385	4.6	22%	N/A

Table 3: Revised Costs and Benefits Anticipated for 2023 RBES Stretch Code

$1,718

	Average Annual Weighted Savings	Package Costs (over 2020 RBES)	Simple Payback (years)	ROI	Cash Flow
Stretch Low Cost 2023	$158	$1,718	10.9	9%	$33
Stretch Low Cost 2023 (with Social Cost of Carbon)	$227	$1,718	7.6	13%	N/A
Stretch All Electric 2023	$908	$4,551	5.0	20%	$577
Stretch All Electric 2023 (with Social Cost of Carbon)	$1,203	$4,551	3.8	26%	N/A
Stretch Blended (81% Fossil & 19% Electric)	$301	$2,256	7.5	13%	$137
Stretch Blended (81% Fossil & 19% Electric) (with Social Cost of Carbon)	$412	$2,256	5.5	18%	N/A

The three analyses we enclose focus on compliance with the Base Code, but the costs we report exceed Stretch Code numbers as well.

- Analysis #1 finds a $11,847 difference.
- Analysis #2 finds a $16,963 difference. This higher number includes carpentry labor.
- Analysis #3 finds a $9,584 - $16,524 difference. This estimate does not include new mechanical requirements.

Besides envelope and mechanical requirements, the base code requires meeting a certain number of "points." Some of these can be seen in Analysis #1. Our preliminary list of "points" costs is appended as "List of Prescriptive Points." To our knowledge there was no professionally reviewed analysis of the cost effectiveness or even the cost of each point. In practice most add more than $1,000 to the cost of the building. Certainly there are not seven points (the number needed for an average sized home) that are cost free.

Further, statute requires that the new code must generate a positive cash flow and an 8% to 27% return on investment (ROI) for a typical new home. One of our members recently analyzed a 1,900 sf home for R-5 continuous insulation. The additional cost was $5,465. It will have a 43-year payback or 2.3% ROI.

Analysis #1

HUNTINGTON HOMES SINCE 1978

			PROPOSED
Client: Benson. 1872sf. 3 bed. 2 1/2 bath Location: Vermont Quote Date: July 8 2025	2015 Code Package 4	2020 Code Package 4	2024 Code Package 1
Modules: Base Price	$268,348	$268,348	$268,348
Delivery	$5,200	$5,200	$5,200
Crane	$4,500	$4,500	$4,500
2x8 EPS Walls	N/A	N/A	$5,456
Add Heatlock Glass - for 1 point	N/A	N/A	$1,276
Option Tax - If Needed			
Module Total:	**$278,048**	**$278,048**	**$284,780**
ONSITE WORK			
Site Improvements / Utilities	TBD	TBD	TBD
Secondary Wire Allowance	TBD	TBD	TBD
Foundation	$21,900	$21,900	$21,900
Add Foundation Wall Insulation. R15 Continuous	$4,680	N/A	N/A
Add Foundation Wall Insulation. R13+10. Includes Drywall Walls	N/A	$10,800	$10,800
Add R10 Underslab Insulation. - For 1 Point	N/A	$3,190	N/A
Add R20 Underslab Insulation - For 2 Points	N/A	N/A	$4,205
R60 Attic - for 1 point	N/A	N/A	Inc
1.5 ACH50. for 1 point	N/A	N/A	Inc
Onsite Carpentry, Materials, and General Conditions	$55,300	$55,300	$55,300
Propane Fired Boiler / Side Arm Hot Water - for 2 Points	$16,900	$16,900	N/A
Propane Fired Boiler / Hybrid Electric Water Heater - for 3 Points	N/A	N/A	$19,400
Change HBWW to low temp units. SlantFln Series 80 - for 1 Point	N/A	N/A	$1,200
Onsite Plumbing	$6,800	$6,800	$6,800
Onsite HRV Unit. Blower Door Test under 2.0ACH50 - 3 Points	N/A	$4,800	N/A
Onsite HRV Unit.	N/A	N/A	$5,200
Onsite Electrical	$9,500	$9,500	$9,500
Solar Ready - for 1 Point	N/A	Inc	N/A
Appliance. Allowance	$10,000	$10,000	$10,000
Porch	$8,500	$8,500	$8,500
Contract Total	**$411,628**	**$425,738**	**$437,585**
	$220	$227	$234 $/sf
Net over 2015 Code		$14,110	$25,957
Net over 2020 Code			$11,847
% increase over 2015 Code		3.43%	6.31%
% increase over 2020 Code			**2.78%**

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Added Cost to comply to 2024 RBES Code compared to 2020 RBES Code

Pricing for average 1600 Sq ft house

Upgraded Features needed to comply to 2024 RBES	Required Feature to meet 2020 RBES	Added Cost to comply to 2024 RBES
R21 cavity wall plus R5 Continuos insulation, Includes added labor and material costs	R21 Cavity wall Insulation	$ 6,375.00
70% SRE Air to Air exchanger ducted and tested	Bath fans with automated timers	$ 6,000.00
Exterior Door jambs extenisions to accomadated thicker walls. Custom sized. Average 3 doors per house	Standard size sills	$ 600.00
Exterior wall Air sealed Electical Boxes	Standard electrical boxes	$ 85.00
Air sealing to meet minumum 2 air exchanges per hour, Materials and Labor	Minumum 3 air exchanges per hour	$ 650.00
Wider window custom jambs for thicker walls	Standard 2x6 wall depth jambs	$ 200.00
	Total Added cost to consumer including Builder Margin	$ 16,963.41

Jim Bradley, Project Manager & Energy Professional
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Cost to Install Rigid Insulation

July 2025

Rigid Wall Insulation Installation Calculator | Zip Code: 05403 | Square Feet*: 2200 | Update

Item details	Qty	Low	High
☑ **Rigid Insulation Cost** Non-discounted retail pricing for popular: 1" x 4' x 8' rigid foam insulated panels with foil facing. R6 rating per inch thickness. Calculated purchase quantity includes overage for typical waste and small future repairs.	2349 SF	$2,804	$3,871
☑ **Rigid Wall Insulation Installation Labor, Basic** Basic labor to install rigid insulation with favorable site conditions. Layout, fit, secure and edge seal rigid insulation boards. Includes planning, equipment and material acquisition, area preparation and protection, setup and cleanup.	31.9 h	$1,656	$3,512
☑ **Rigid Wall Insulation Installation Job Supplies** Cost of related materials and supplies typically required to install rigid insulation including: fasteners, vent flow baffles and sealing tape.	2349 SF	$124	$141
Totals - Cost To Install Rigid Insulation	2200 SF	$4,584	$7,524
Average Cost per Square Foot		$2.08	$3.42
Assume extension jambs for 20 openings @ $250-450 each		5,000	9,000
		$ 9, 584	**$16,524**

This analysis does not include the extra 1” of continuous rigid insulation that is recommended for Climate Zone 6 (+ $2,500).

It also does not include cost for seven (7) points.

Actual Costs for Prescriptive Path Points (2024 RBES)
Compiled July 15, 2025

Costs for "Points"

The analysis submitted to LCAR 4/24/23 was for the "average house size." No size stated.
RBES includes the area of unfinished basements, attics, storage, and utility areas. We are therefore using the category "Single family homes 2500 - 4000 sf" which is required to meet seven points.

Component		Description	Points	Incremental Cost above Base Code
Envelope	Slab	R-20 @perimeter and below all	2	$4,205
		R-25 @perimeter and below all	3	(more)
	Walls	R-28 (U-0.036)	1	$1,276
		R-35 (U-0.028)	2	(more)
		R-40 (U-0.025)	3	(more)
		R-48 SIPs (U-0.021)	4	(more)
	Ceiling	R-60 flat/R-49 slope (U-0.021)	1	
		R-80 flat/R-60 slopes (U-0.018)	2	
	Cold floors	R-49 (U-0.021)	1	
	Windows	Triple Pane U-0.27 or better	1	$1,200
		Triple Pane U-0.25 or better	2	(more)
		Triple Pane U-0.21 or better	3	Avg 20 windows @ $360 each = $7200
		Triple Pane U-0.18 or better	4	(more)
	Ext. doors	U-0.26	1	
Air leakage	Tight	0.11 CFM50/sf or better	1	
	Tigher	0.07 CFM50/sf or better	2	
	Tightest	0.03 CFM50/sf or better	3	
Mechanical ventilation	Testing	Testing as specified	1	
Heating & Cooling	Equipment	Energy Star AFUEs: gas furnace >95, oil furnace>85, …	1	Most contractors meet this standard already. $0 cost.
	Cold Climate Pump	Whole building - Energy Star v.6	5	$2,500
	Ground Source Heat Pump	Whole building - Energy Star	10	$53,500 above propane system if one can find a designer/installer
	Air to water Heat Pump	Whole building - COP > 2.5	5	Are these even available in Vermont?
	Advanced Wood Heat	Comply w RERCVT.org eligible equipment	5	$44,500 above propane system
	Low Temp Hydronic system	Designed to meet peak heat demand w 120 deg water	1	$1,200
	Demand Responsive Thermostats	All thermostats equipped with demant responsive controls	1	$1,500 just for subpanel.
Water	Basic Heat Pump	Elec H20 heater UEF>2.20	3	
	Advanced Heat Pump	Elec H20 heater UEF>3.3	5	
	Low Flow	Shwrs <1.75 gpm, Lavs <1.0 gpm, toilets < 1.28gpf	1	
	Certified	WERS, Watersense, HERS	2	
	Drain Heat Recovery	on primary showers and tubs	1	
	Recirculation	System w push button for remote fixtures	1	
	Pipe insulation	R-4 throughout building	1	
	Demand Responsive Controls	Elec storage H2O heater w on-demand controls	1	
	Point of Use	Remote fixtures have local source of heat	1	
	Solar Ready Zone	R402.7 compliant	2	
	Solar Hot Water	System meets 50% of annual hot water load or better	2	
Renewables	On site generation	PV or other system: 1 point per 1.5 kw, max 4	varies	
Other	Monitoring	Whole building, min 5 circuits	1	
	Radon system	to EPA standards	1	
	Energy Model	Modeled and followed	1	$5,000 + outside Chittenden County
	Battery	Min 6kWh grid connected	1	
	Adv. Lighting Controls	50% of building is controlled continuously/automatically	2	