Vermont Multifamily Energy Efficiency Retrofit Program

Retrospective

2009 through 2017

3E Thermal invests in Vermont apartment buildings

3E Thermal provides building testing and analysis, design review, progress inspection, and cash project incentives toward comprehensive energy efficiency retrofit work in qualifying multifamily properties throughout Vermont.

Properties qualify if the tenants are low-income or the rental rates (including utilities) are below 30% of 80% of Area Median Income. Property owners also must be undertaking significant improvements and making substantial investments.

3E Thermal was formerly known as Vermont Fuel Efficiency Partnership (VFEP) from its inception in mid-2009 through early 2015. 3E Thermal is a statewide program of Capstone Community Action, and partners closely with the Weatherization Assistance Program, Efficiency Vermont, renewable energy programs, housing agencies, and private owners.

This paper reviews the landscape of Vermont multifamily buildings and the impact of 3E Thermal and collaborating programs from 2010 through 2017.

How many Apartments are there in Vermont?

Surprisingly, hard data are hard to come by. Data reviewed from a number of sources aligns fairly closely, but not at all exactly. Data about occupancy type are rough estimates, and details heating type are virtually educated guesses (i.e., central heat, nearly always paid by the owner, versus per-unit heat, typically paid by tenant).

However, below is a reasonably close picture of the universe of Vermont households, the portion of the total that is low-to-moderate income multifamily, and the characteristics of that portion.

The Take-Away

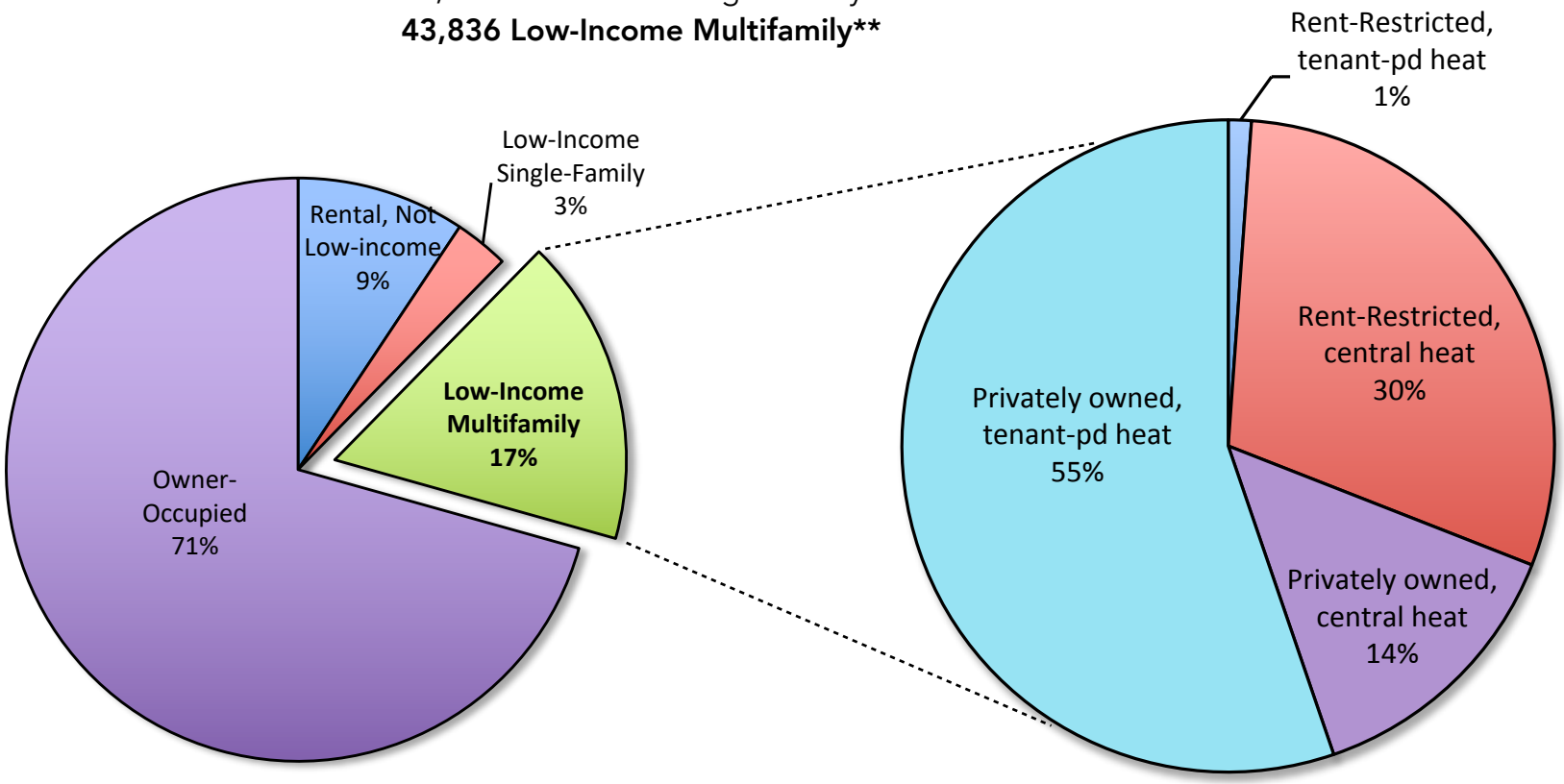
About 69% of low-to-moderate-income multifamily rental properties are privately owned. Of those, three-quarters are tenant-paid heat, which pose the knotty "split-incentive" problem — how to get owners to invest in energy efficiency when they don't receive a direct financial return.

Multifamily Rental Housing in Vermont

257,758 Total Households in Vermont*
182,112 Owner-Occupied
76,646 Renter-Occupied

76,646 Renter-Occupied
24,094 Non-Low-Income Rental
7,716 Low-Income Single-Family
43,836 Low-Income Multifamily**

43,836 Low-Income Multifamily
30,270 Privately Owned, Unrestricted
13,566 Public, Nonprofit, or Rent-Restricted



30,270 Privately Owned, Unrestricted
6,054 Owner-Paid (Central) Heat
26,216 Tenant-Paid Heat

13,566 Public, Nonprofit, Rent-Restricted
13,066 Owner-Paid (Central) Heat
500 Tenant-Paid Heat

***** not including Seasonal, Temporary or Out of Service
****** Low-Income defined as households below 80% of Area Median Income

Sources: VT Housing Finance Agency, based on 2016 census data
NOTE: Despite apparent precision, all figures are estimates.

How much progress has 3E Thermal made?

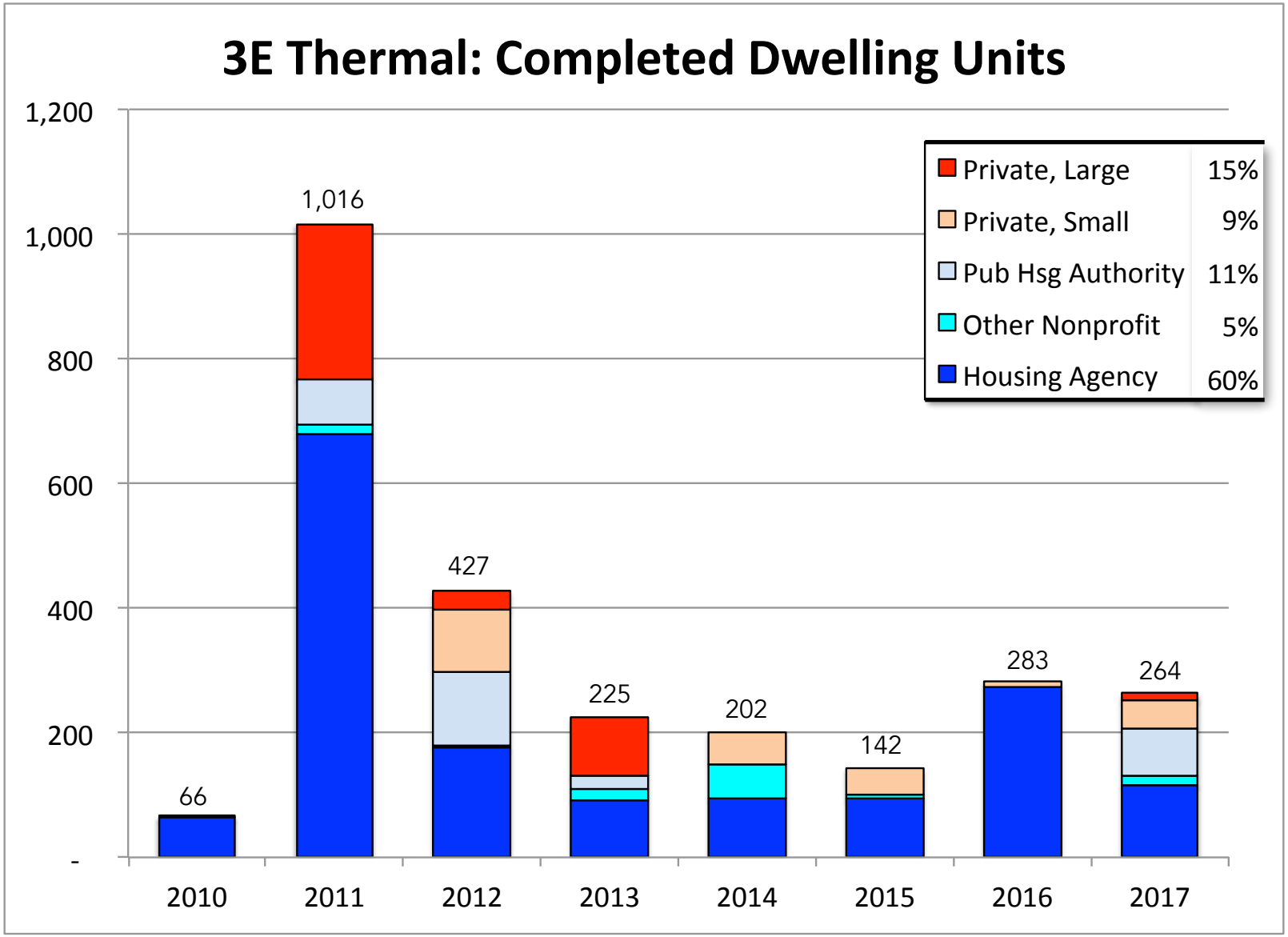
3E Thermal's key metric is savings rather than number of dwelling units completed. Still, units is an important consideration. The rate of unit completion closely tracks funding, which spiked in early years due to federal ARRA* stimulus funding.

The Take-Away

At current funding levels, 3E typically completes roughly 200 to 300 units annually. Projects owned by regional and statewide housing agencies have been about 60% of completed units thus far. We anticipate the future will bring a greater proportion of privately owned projects, which will likely lower the total number of units due to the higher level of support required.

*Abbreviations and acronyms are explained in footers throughout this paper.
ARRA - American Recovery and Reinvestment Act

3E Thermal: **ALL Projects 2010 - 2017,** by Ownership Type



Who pays for the work for the various Owner Types?

Private landlords own 69% of Vermont's low-to-moderate-income apartment rentals — clearly we must reach the private market to have a real impact on multifamily housing. **In the yellow highlighted table below:**

- **"% of Public $"** is the proportion of all public funding (including 3E Thermal and program partners) invested in properties owned by each Owner Type. *Corresponds to "Public $" bars in chart.*
- **"Owner % of Project"** is the proportion of total project costs paid by Owner for each Owner Type. Total project costs include both Public and Owner investments. *Corresponds to "Owner $" bars.*
- **"% of 3E $"** is the proportion of 3E Thermal's total project incentives expense (i.e., not including expenses for technical support and administration). *(Not shown in chart.)*
- **"3E as % of Owner $"** is the proportion of 3E's investment compared to Owner's investment (3E $ / Owner $). *(Not shown in chart.)*

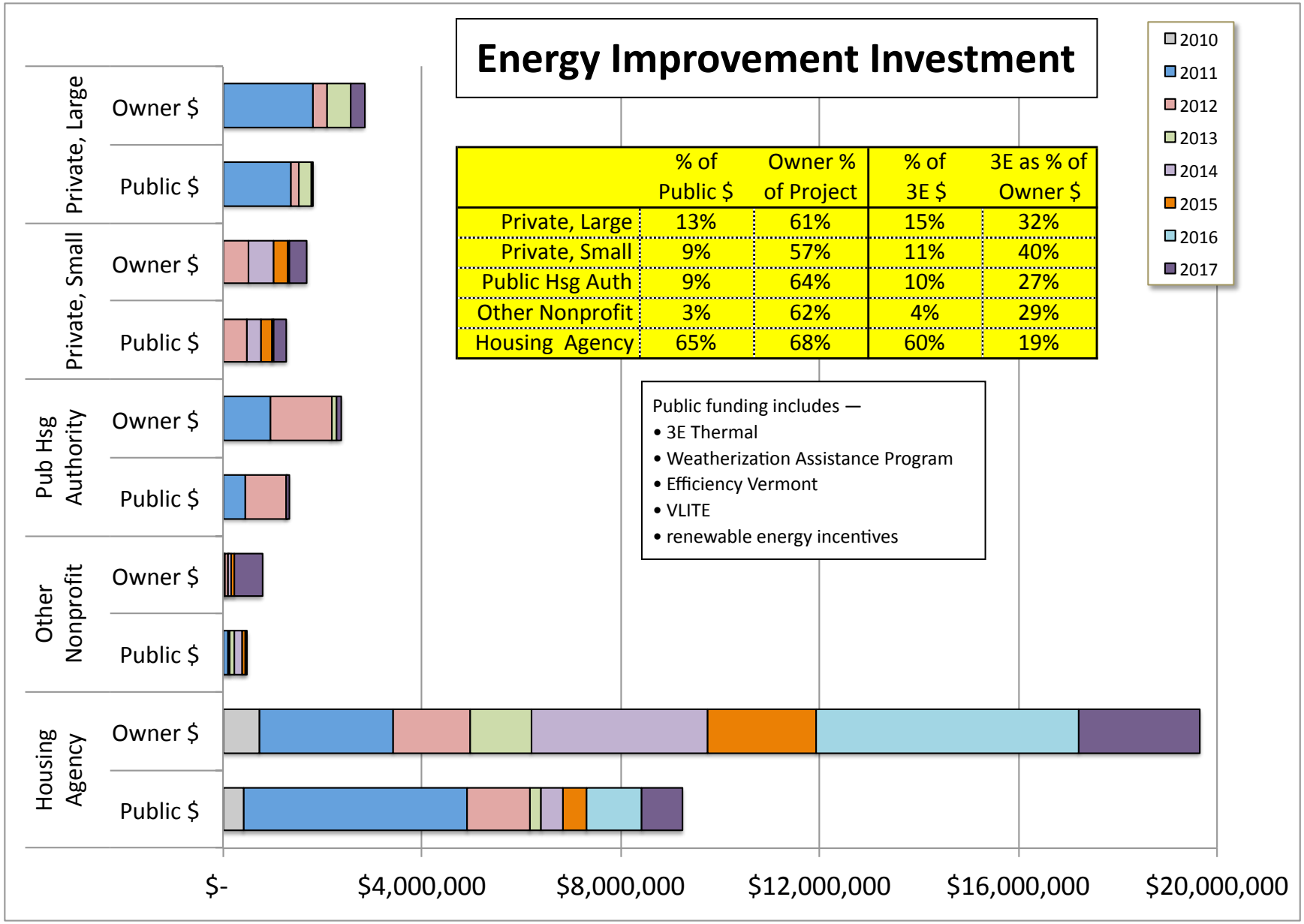
Non-energy-related project cost (e.g., remodeling, painting, etc.) is not including in Energy Improvement Investment.

THE TAKE-AWAY

Housing Agencies, the owners of about 60% of completed dwelling units, have so far consumed about 65% of public investments in these projects for energy efficiency and renewables. They have also invested the highest proportion of the total project costs (68%).

3E Thermal's project incentives investment as a proportion of Owner's investment has been highest for Small Private Owners, 40%, and these Owners have had the highest level of support from all public funding: their proportion of total project costs has been lowest at 57%.

3E Thermal: **ALL Projects 2010 - 2017,** by Ownership Type



	% of Public $	Owner % of Project	% of 3E $	3E as % of Owner $
Private, Large	13%	61%	15%	32%
Private, Small	9%	57%	11%	40%
Public Hsg Auth	9%	64%	10%	27%
Other Nonprofit	3%	62%	4%	29%
Housing Agency	65%	68%	60%	19%

Public funding includes —
- 3E Thermal
- Weatherization Assistance Program
- Efficiency Vermont
- VLITE
- renewable energy incentives

Investment costs for installation of energy efficiency and renewables measures. Source: 3E Thermal, July 2018.

Who pays for the work, by Owner Types, *post-ARRA*?

Early funding for 3E spiked high, due to federal stimulus funding during ARRA. The funding environment since 2013 has been more stable, growing incrementally, so this provides a clearer picture of the work being done.

Again, in the **yellow highlighted table below:**

- **"% of Public $"** is the proportion of all public funding (including 3E Thermal and program partners) invested in properties owned by each Owner Type. *Corresponds to "Public $" bars in chart.*
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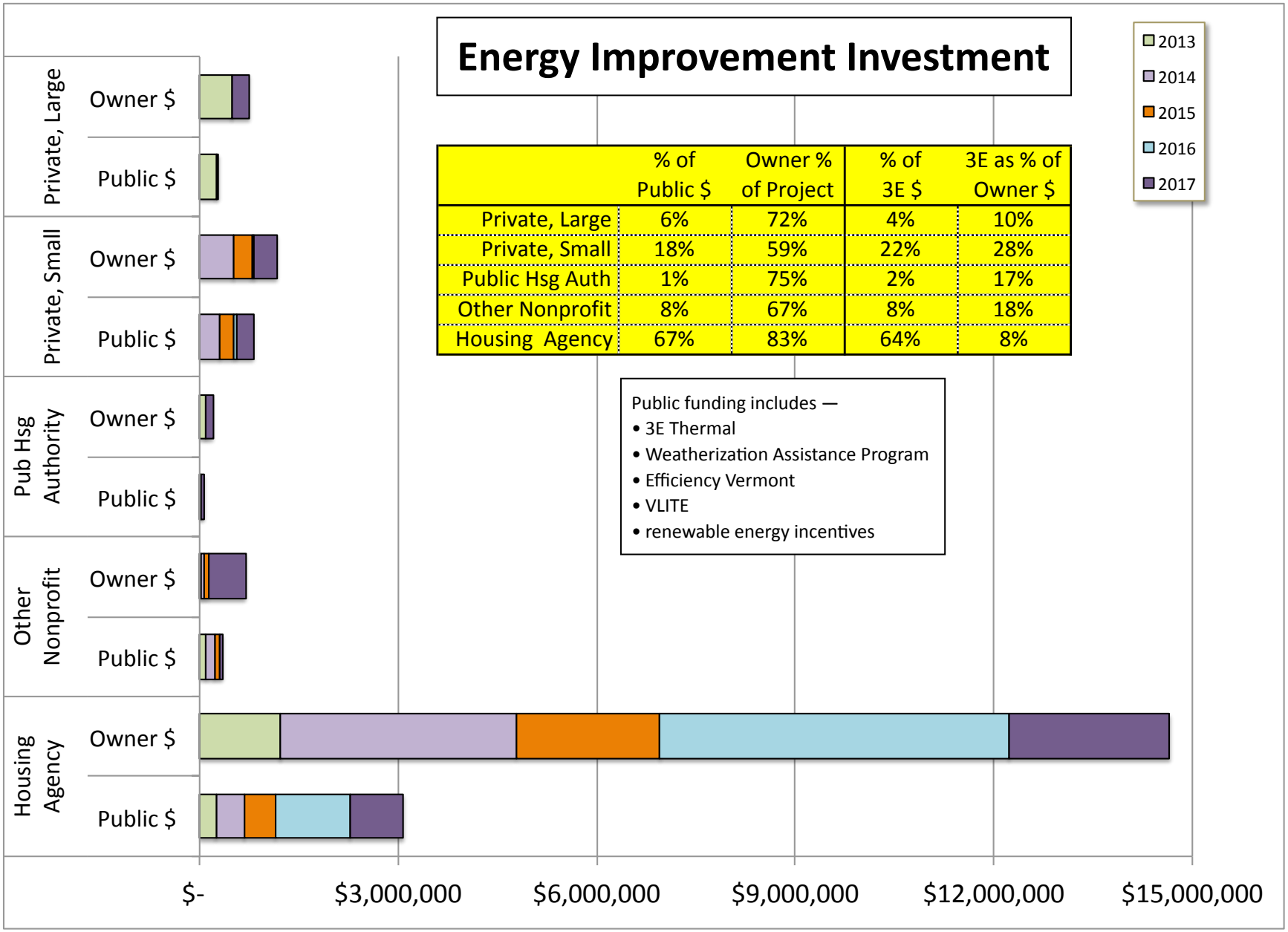
Non-energy-related project cost (e.g., remodeling, painting, etc.) is not including in Energy Improvement Investment.

THE TAKE-AWAY

The proportion of public investment in Housing Agency projects post-ARRA is not significantly different from the entire 2010 - 2017 period (67% versus 65%). But Owner share of costs is substantially higher (83% versus 68%).

On the other hand, the proportion of public investment in projects owned by Small Private Owners is double, 18% versus 9%. These owners are paying a slightly higher proportion of total project costs (59% versus 57%). But 3E investment as proportion of Owner investment is much lower (28% versus 40%), leveraging significantly more investment from owners and other programs.

3E Thermal: **Post-ARRA Projects 2013 - 2017,** By Ownership Type



	% of Public $	Owner % of Project	% of 3E $	3E as % of Owner $
Private, Large	6%	72%	4%	10%
Private, Small	18%	59%	22%	28%
Public Hsg Auth	1%	75%	2%	17%
Other Nonprofit	8%	67%	8%	18%
Housing Agency	67%	83%	64%	8%

Investment costs for installation of energy efficiency and renewables measures. Source: 3E Thermal, July 2018.

Where has the money come from overall?

Breaking down Public Funding into constituent parts, and comparing it to overall Owner investment (regardless of Owner Type), provides another perspective.

THE TAKE-AWAY

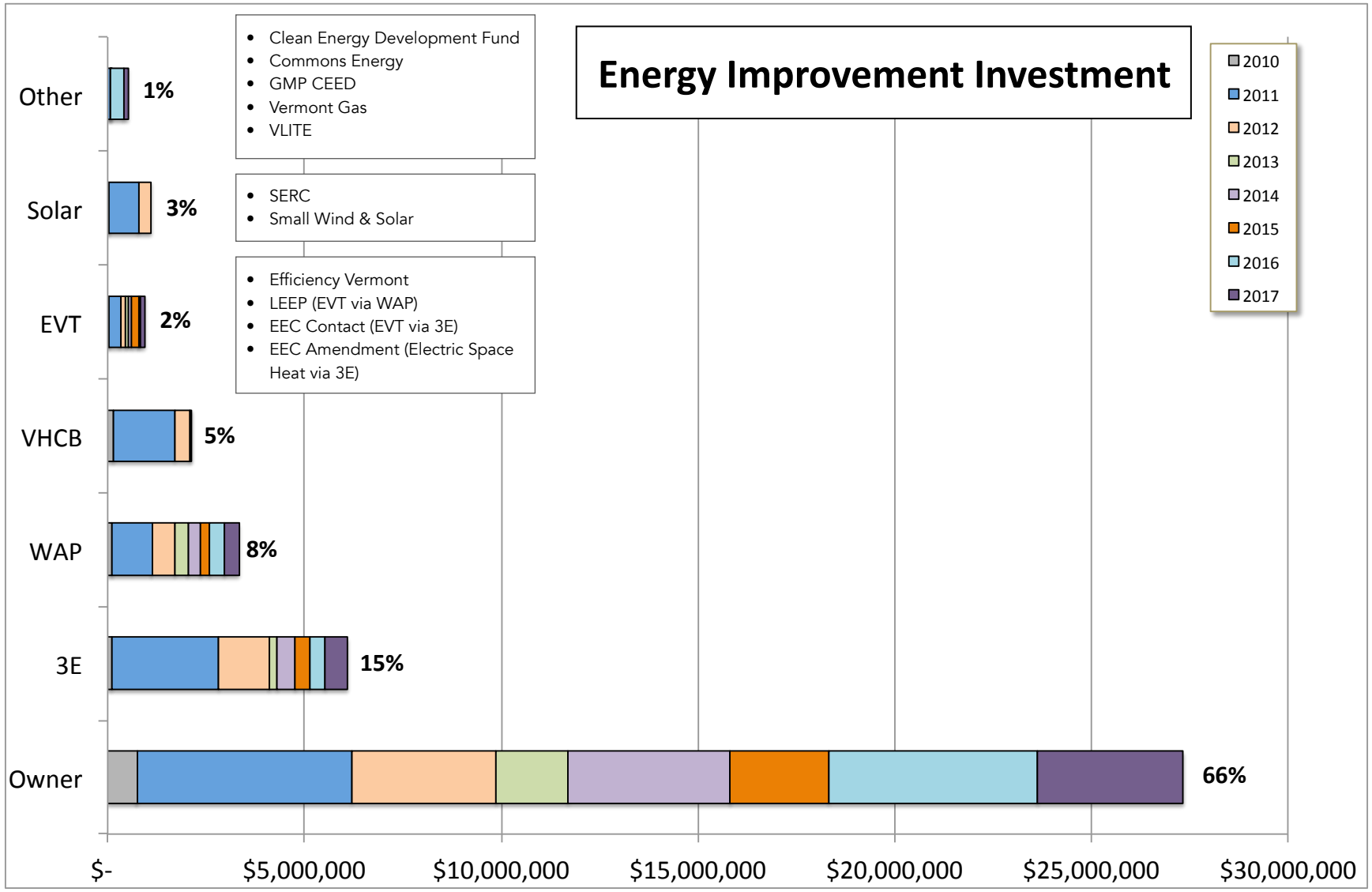
Overall, Owners have invested 66% of project costs.

3E Thermal invested 15% of project costs (as project incentives), a significant share of that amount during ARRA days. WAP was about half of 3E's proportion; WAP also had increased funding during ARRA.

Other sources, notably VHCB and Solar, also had more funding targeted to energy upgrades during ARRA.

WAP - Weatherization Assistance Program
VHCB - Vermont Housing & Conservation Board
SERC - Sustainable Energy Resources for Consumers, a US Dept of Energy program
GMP CEED - Green Mountain Power, Community Energy & Efficiency Development fund
VLITE - Vermont Low-Income Trust for Electricity
LEEP - Low-income Electrical Efficiency Program
EVT - Efficiency Vermont
EEC - Electric Efficiency Charge

3E Thermal: **ALL Projects 2010 - 2017,** by Investment source



Investment costs for installation of energy efficiency and renewables measures. Source: 3E Thermal, July 2018.

Where does the money come from now, *post-ARRA*?

Since 2013, distribution of investment has been more constant.

THE TAKE-AWAY

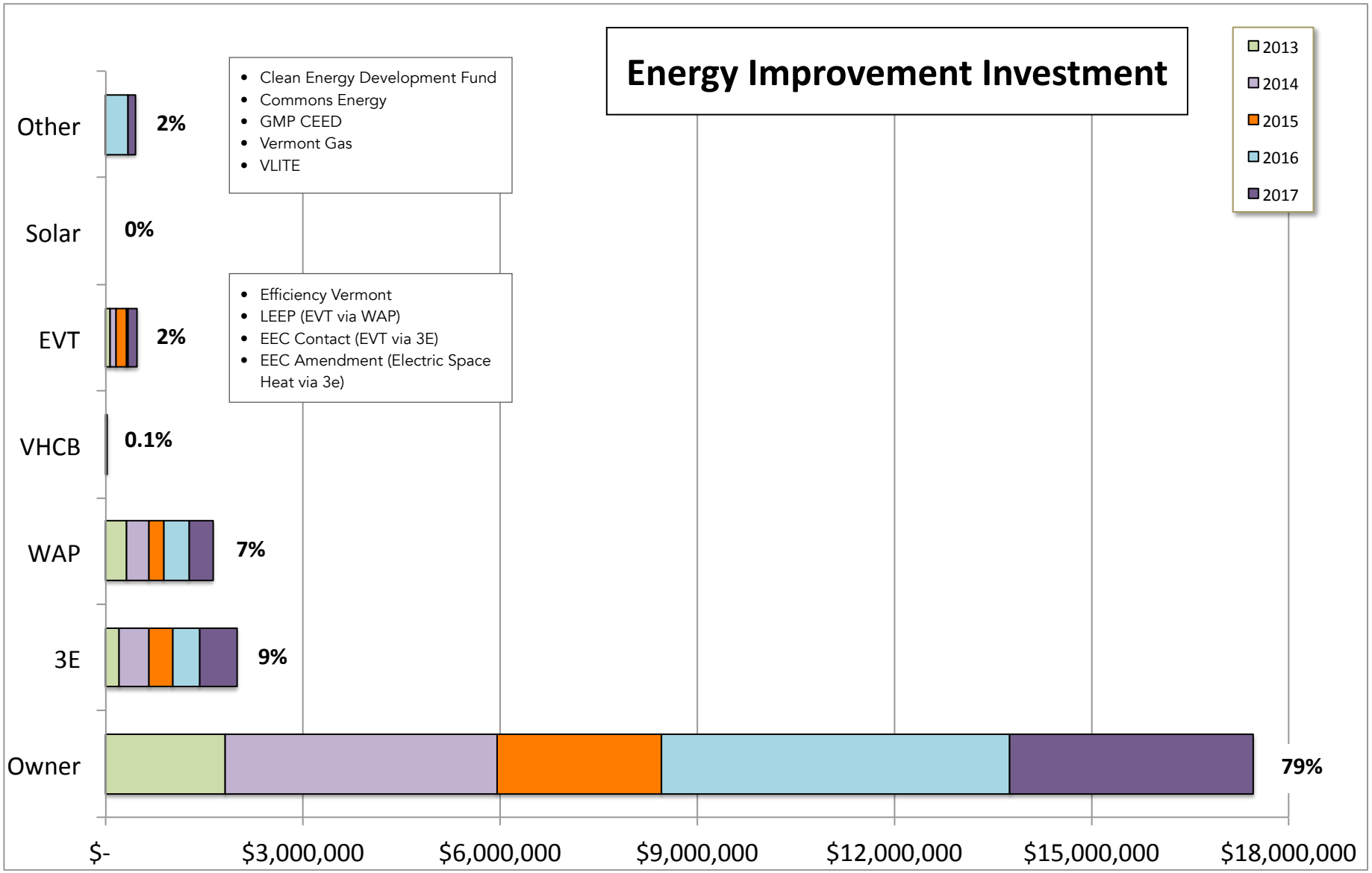
Owners are shouldering a higher proportion of project costs, 79% versus 66% over the entire 2010-2017 period.

3E Thermal proportion of project costs (as project incentives) is much lower, 9% versus 15% for the entire 2010-2017 period. It is comparable to WAP's proportion, which is nearly the same (7% versus 8%).

Solar thermal (for domestic hot water) has been displaced by solar electric (photovoltaics, PV). 3E has not been tracking PV investments, so they are not included here.

VHCB energy efficiency funding has likewise ended. 3E does not track general VHCB investment, which is significant in nonprofit agency projects but is not easy to parse between energy efficiency investments and overall funding support.

3E Thermal: **Post-ARRA Projects 2013 - 2017,** by Investment source



Investment costs for installation of energy efficiency and renewables measures. Source: 3E Thermal, July 2018.

What has been the funding picture just for 3E, for both installation incentives and total funding?

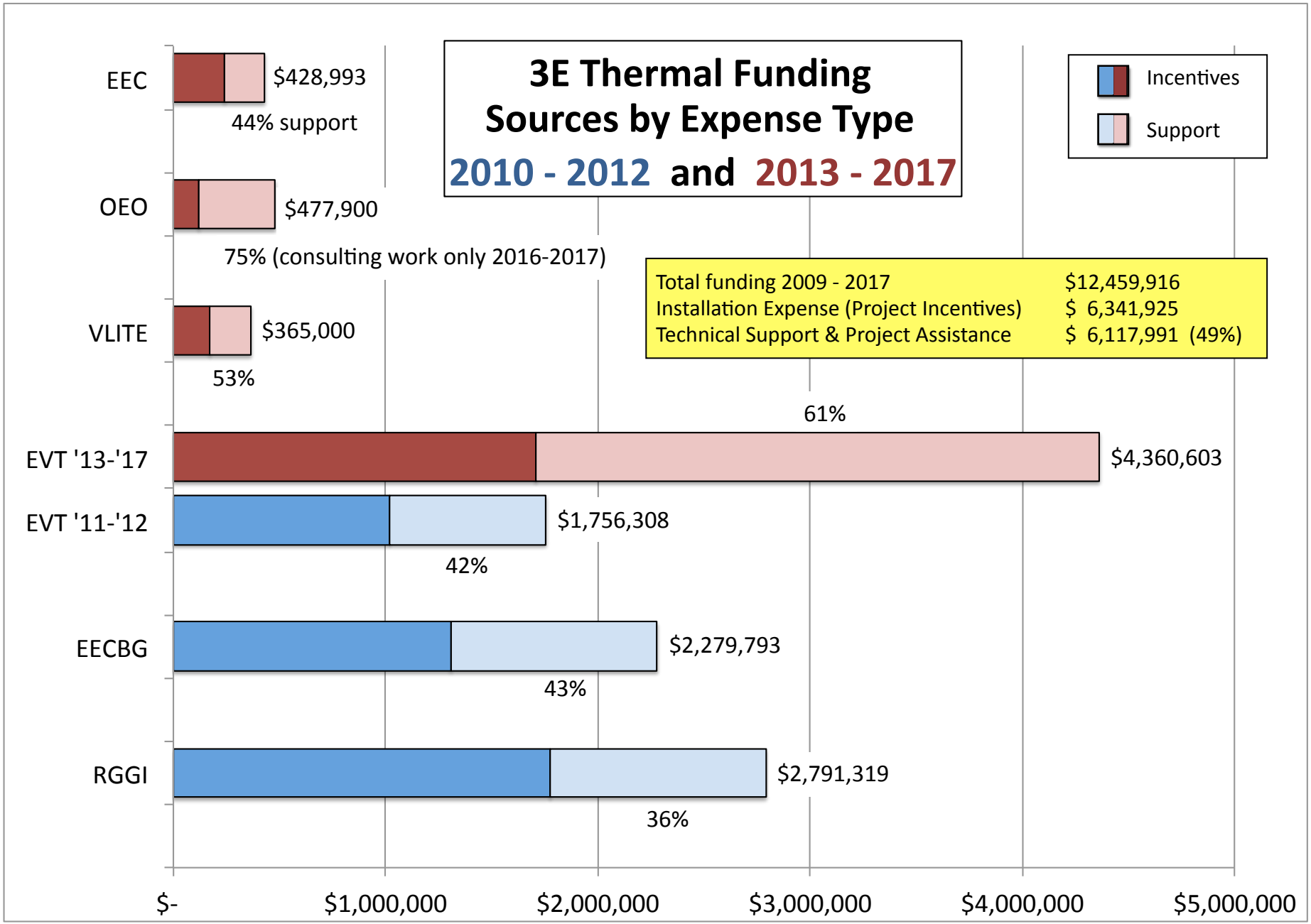
3E Thermal has received funding from DPS (RGGI, EECBG), EVT, VLITE, and OEO WAP.
"Incentives" expense is direct investment in energy efficiency project costs.
"Support" expense covers analysis, work scope development and construction support, and all program administration.

THE TAKE-AWAY

The proportion of Support expense increased after 2013 (in red), as overall funding declined after ARRA, and as the vital importance of dedicated technical assistance, design and specification review, field inspections, etc., became clear.

Coordination with other programs (WAP, EEC Contract, EEC Amendment, renewable energy programs) has also tended to drive up support expense in EVT since 2013.

DPS - Vermont Department of Public Service, the state's consumer advocate on utility and energy matters.
RGGI - Regional Greenhouse Gas Initiative, a cap-and-trade system on electric generation emissions that includes 10 northeast U.S. states since 2008 (New Jersey exited for part of the time).
EECBG - Energy Efficiency and Conservation Block Grant, an ARRA program.
EEC Contract - Electrical efficiency services typically offered by EVT. For 3E projects, EVT contracts with 3E to provide those services (separately from thermal efficiency services).
EEC Amendment - EVT typically handles projects with electric space heating itself, in-house. On occasion it contracts with 3E separately via "amendment."



Source: 3E Thermal, July 2018

What has the annual flow of funding for 3E looked like?

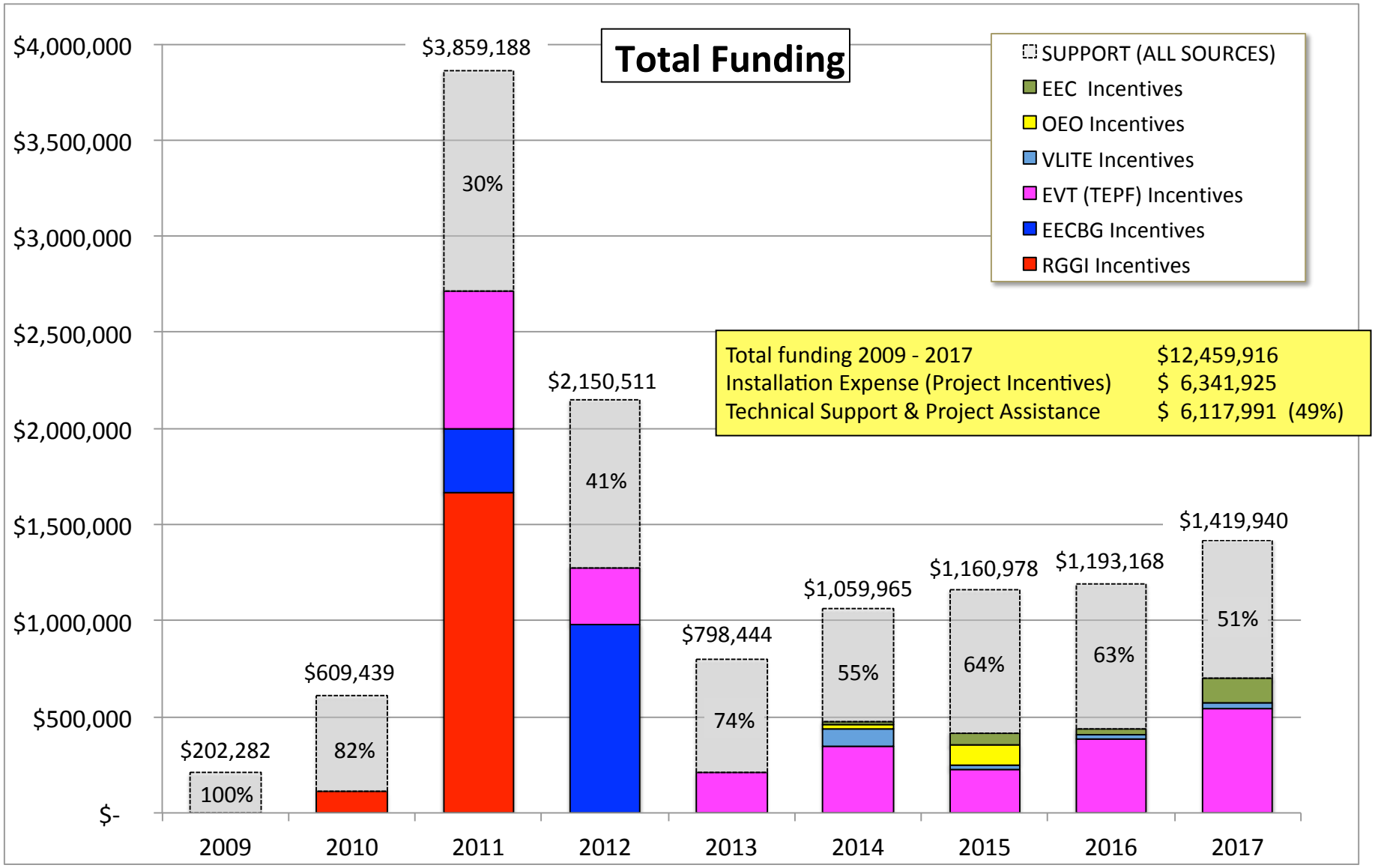
The steep increase in funding in the first years, when program design was still developing rapidly, posed significant challenges.

THE TAKE-AWAY

The gray section of each column includes support costs from all funding sources. Since 2013, both staffing and costs have been pretty stable, though the proportion has fluctuated somewhat. Some factors:

- **In 2015, a large number of projects were delayed, hence delaying associated project incentives for installation costs.**
- **OEO funding after July 2015, totaling $235,000 through 2017, was for consulting only ("support"), no project incentives.**

3E Thermal Projects: **3E Thermal Funding History**



3E Thermal began operations (as Vermont Fuel Efficiency Partnership) in July 2009; the first completed projects were in 2010.

How effective — and cost-effective — has 3E been?

3E's primary metric is energy savings, measured in MMBTU. Therefore, expense per MMBTU saved is an important measure of how cost-effective 3E's services are. MMBTU savings is a calculation based on a heat-loss model of the pre-retrofit building, trued to actual fuel-usage history, but are inevitably broad estimates.

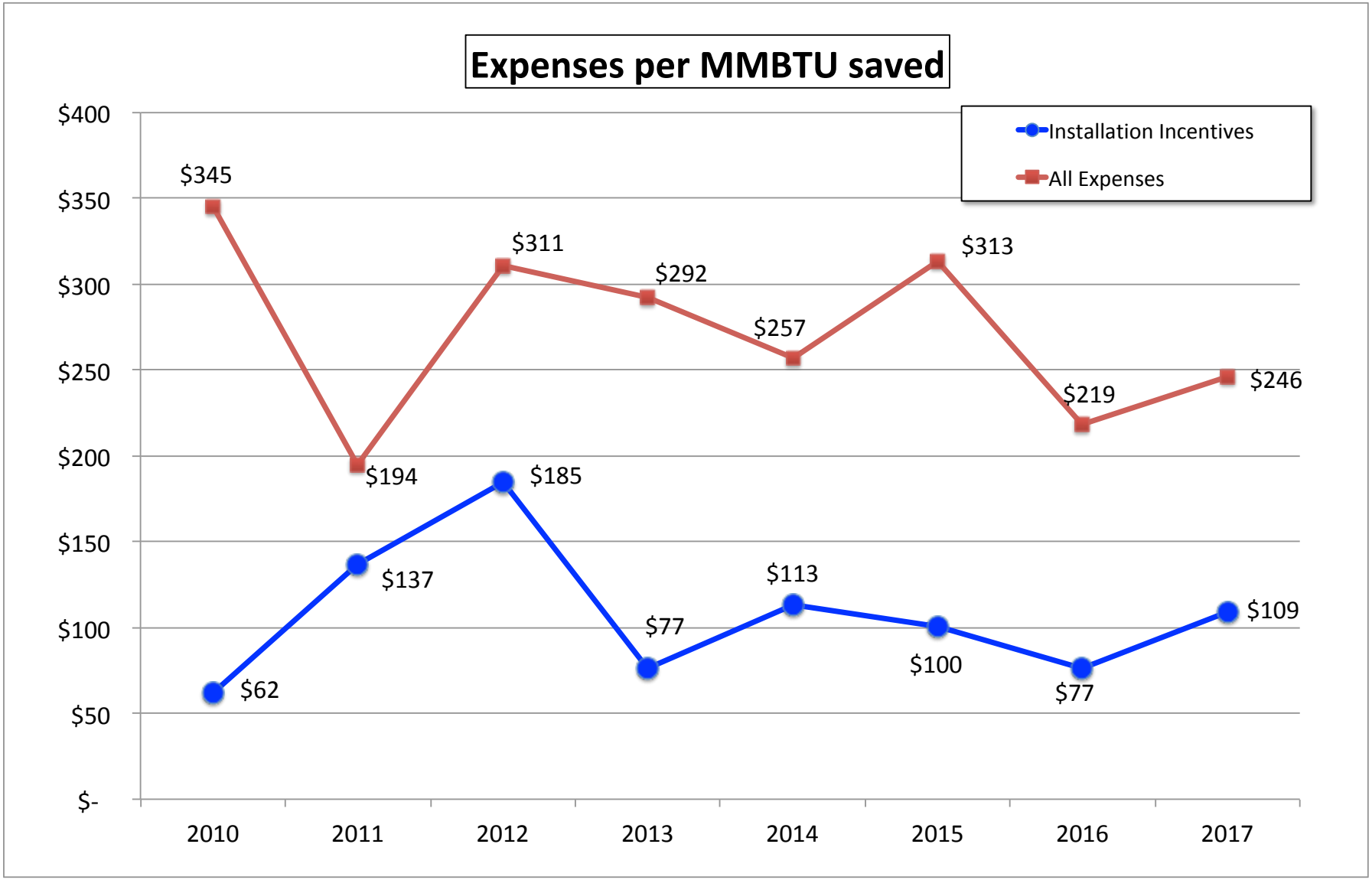
THE TAKE-AWAY

Starting in 2013, 3E has targeted about $80 - $100 of installation incentive per estimated MMBTU saved. Circumstances (budget, particular projects) sometimes dictate higher or lower incentive. As well, the arbitrariness of slicing budgets into annual chunks results in variation of the ratio: typical projects take 2 to 3 years from inception to completion; many take twice as long.

The unavoidable delay of several projects in 2015 is apparent in the higher-than-usual All Expenses per MMBTU figure that year ($313, red line). Completion of many of the delayed projects in 2016 shows in the lower-than-usual figure that year ($219).

MMBTU - Million (Mega Mega, or thousand thousand) British Thermal Unit

3E Thermal: **Funding per MMBTU saved** (estimated)



Savings calculation based on customer economics; calculation for EVT metrics differs slightly. Source: 3E Thermal, July 2018

How close are actual savings to estimated?

"Actual" savings figures are nearly as difficult to rely on as estimated. We use the term Apparent Savings to acknowledge the reality that weather conditions, occupancy and the difficulty of measuring accurately usage of delivered bulk fuels, among other factors, affect the comparison of pre-retrofit and post-retrofit fuel usage.

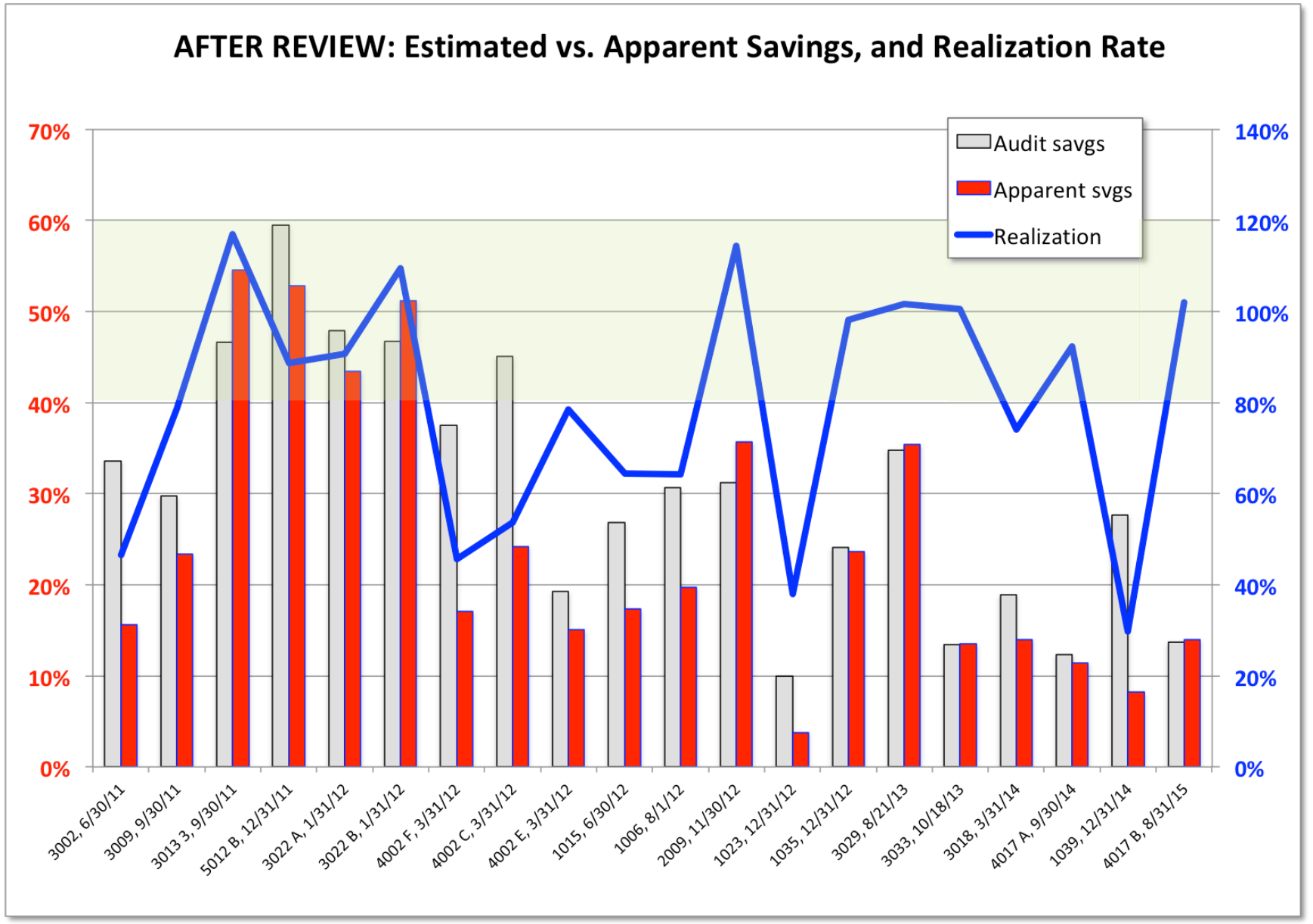
With that caveat, the standard metric for assessing how close Apparent savings are to Estimated is the Realization Rate, the ratio of Apparent / Estimated. 3E has researched post-retrofit usage periodically, including this past year. Results of that and other recent studies are as follows:

Study	Building Type	Aggregate Predicted Savings	Aggregate Apparent Savings	Realization Rate
2017 3E Thermal internal review	multifamily	27%	21%	76%
2013 3E Thermal (VFEP) internal review	multifamily	32%	24%	75%
2013 VT Gas Systems, Market Rate	single family	26%	23%	89%
2013 VT Gas Systems, Low-Income	single family	26%	16%	62%
2013 Efficiency Vermont, Market Rate	single family	35%	18%	51%

THE TAKE-AWAY

The problem of bulk fuels, in particular, severely limits the number of projects with good data (so much so that few third-party impact evaluations use such projects). Two or three heating seasons post-retrofit are needed to help cancel out "noise." We expect more recent projects, benefitting from greater consulting input during design phase and more frequent progress inspections, will yield higher Realization Rates. However, Apparent Savings within 20% +/- of Estimated (light green area) seems to be within the tolerances of the degree of analysis that is practical and the variances affecting calculation of Apparent Savings.

Estimate Accuracy: 3E Thermal projects



Study sample arranged by in-service date.

Source: 3E Thermal Internal Review and Report on Results of Energy Efficiency Improvements, June 2018.

Are we done yet?

No. We have made a dent, but there are far more affordable apartments left to be improved.

The 2,625 apartment units completed are in 345 buildings, and represent 152 projects (a project is a single financial development package). 3E has 137 other projects in its database that have stalled, been cancelled, or been put on indefinite hold. We expect that a reputation for competence and reliability will improve our batting average in coming years.

THE TAKE-AWAY

3E Thermal has penetrated only about 6% of the total affordable apartment rental market — 16% of the market of low-to-moderate-income *centrally heated* apartments (both rent-restricted and privately owned). Penetration of *in-unit tenant-paid heat* market has been negligible; the split-incentive problem is still a hurdle.

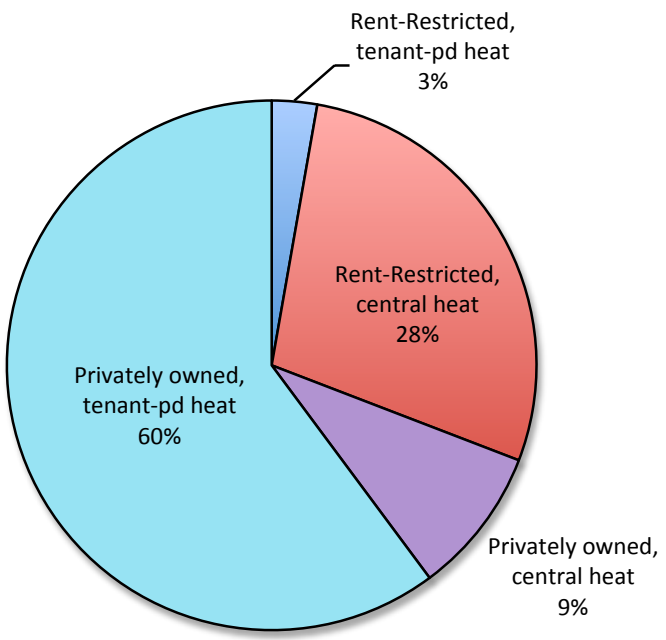
Our efforts to promote multifamily energy upgrades continue. We engage with nonprofit owners and developers at every opportunity; we are working harder to market to private owners; our reputation as knowledgeable, reliable, unbiased consultants is growing. (We have been hired on a fee basis, outside regular program activities and with no cash incentives to offer, on more than a dozen projects since 2015.)

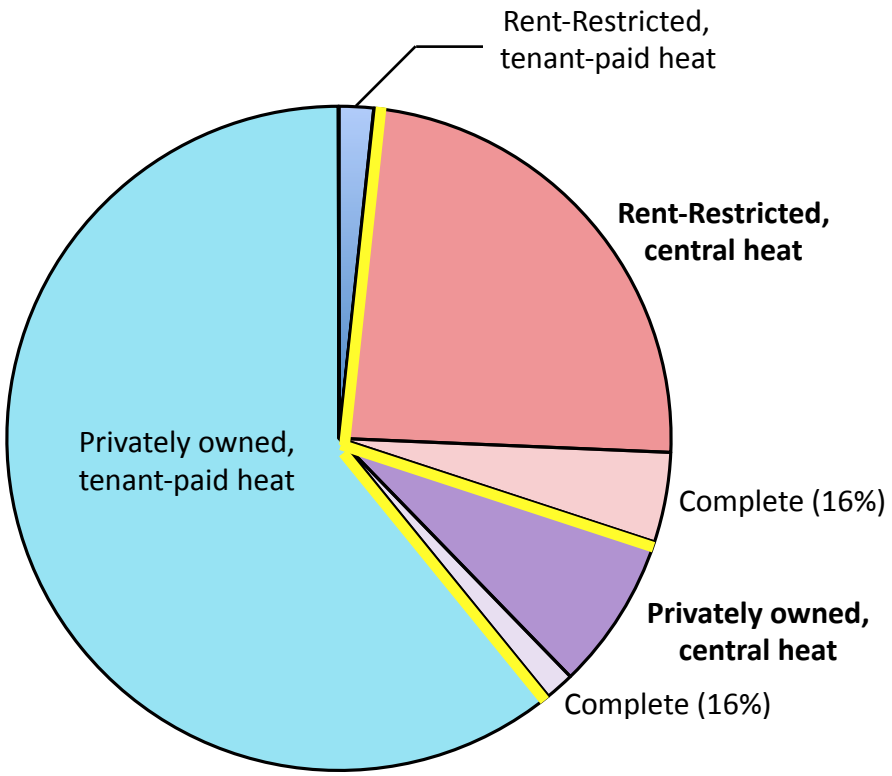
Our challenge is to demonstrate expertise and a compelling service for owners of the 94% of eligible properties remaining to be improved.

> *"Any property owner thinking about renovating their building should definitely talk to 3E Thermal before they dismiss any ideas…. These guys are professionals — they're educated, they're dedicated, they're passionate. I can't say enough good things about them."*
>
> *— Jon Milne, private apartment building owner*

Low-Income Multifamily: 3E Thermal Completed 2010 - 2017

All Low-Income Multifamily





43,989 Low-Income Multifamily

3,955 Privately Owned, Owner-Paid Heat
26,468 Privately Owned, Tenant-Paid Heat
12,350 Rent-Restricted, Owner-Paid Central Heat
1,216 Rent-Restricted, Tenant-Paid Heat

2,625 completed by 3E (through 2017)

615 (16%) Privately Owned, Owner-Paid Heat
15 (0%) Privately Owned, Tenant-Paid Heat
1,975 (16%) Rent-Restricted, Owner-Paid Central Heat
20 (3%) Rent-Restricted, Tenant-Paid Heat

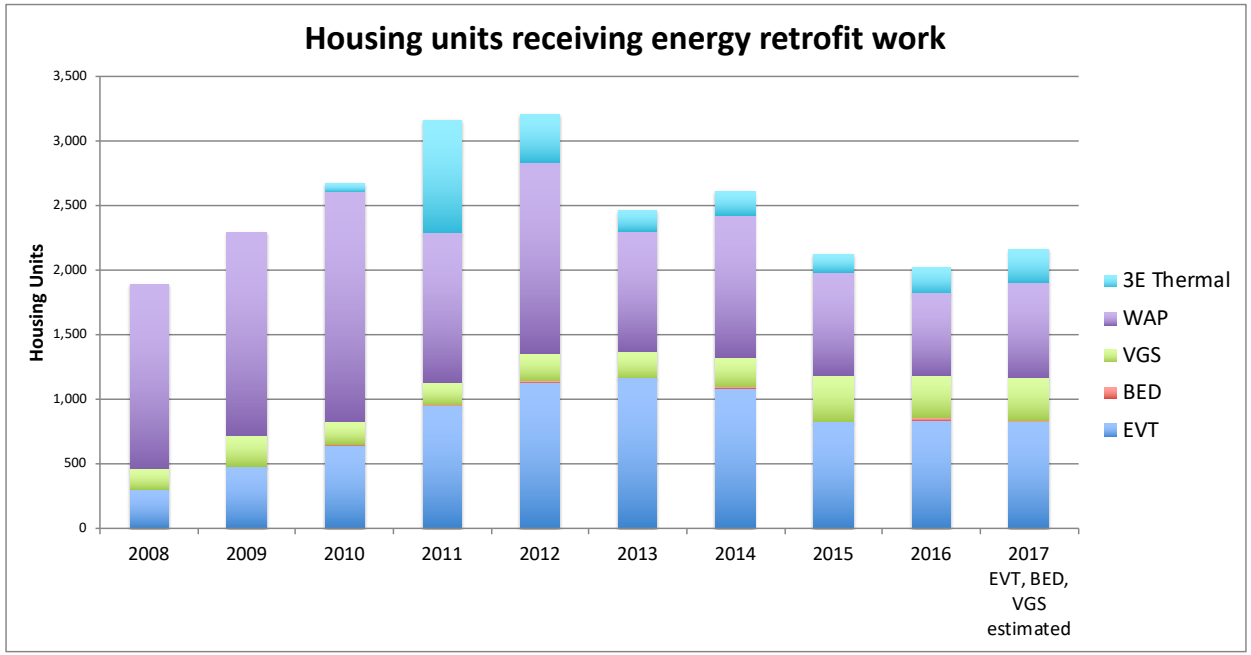
All Low-Income: See page 4 of this report. 3E Thermal completed projects: 3E Thermal data as of 12/31/2017.

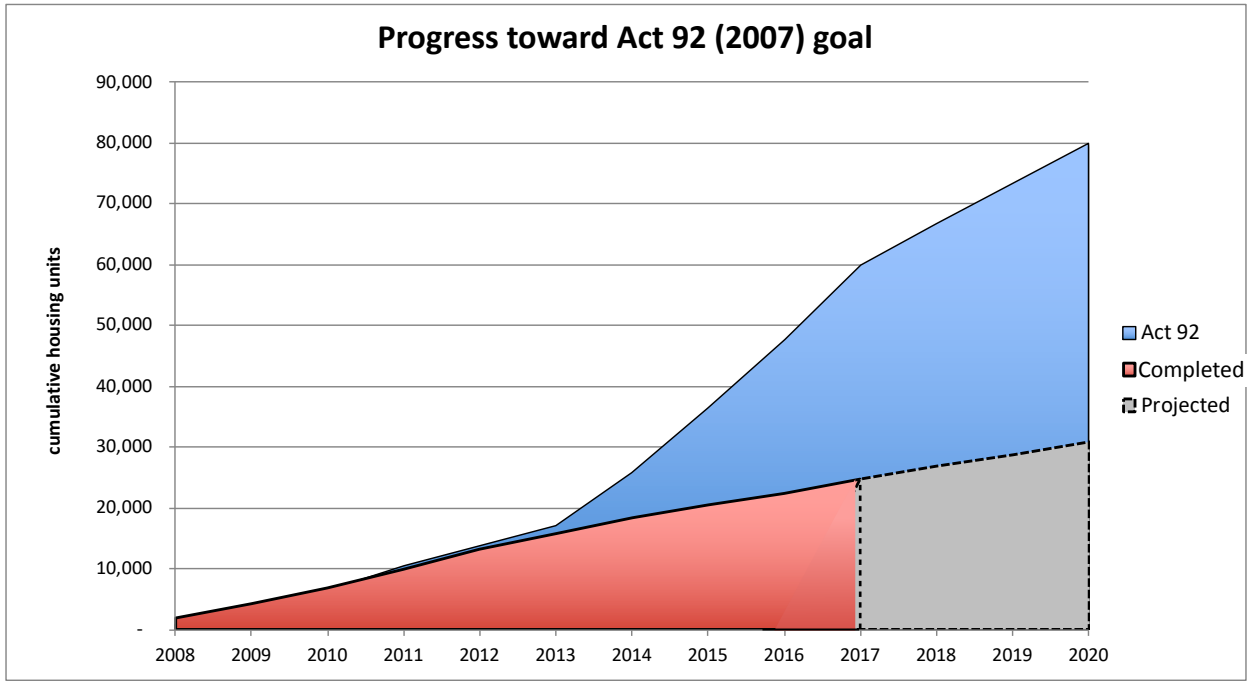
How much progress is Vermont making overall?

The Vermont Legislature passed Act 92 in 2007 calling for "substantially improving the energy fitness"of 25% of the state's housing stock by the year 2020. Act 92 defined energy fitness as reducing fuel needs by an average 25%.

THE TAKE-AWAY

Unfortunately Vermont's energy upgrade efforts are far off the pace necessary to achieve this goal. Various proposals are in discussions to increase funding for WAP and other programs.





Source: Data compiled by 3E Thermal and Dept of Public Service, 2017 - 2018.

3E Thermal

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This overview of 3E Thermal activities 2010 through 2017 prepared by Scott Campbell, August 2018.